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Arizona Corporation Commission



Docket No. E-00000D-07-0376

Decision No. _____

Fifth Biennial Transmission

Assessment

2008-2017

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FINAL DRAFT

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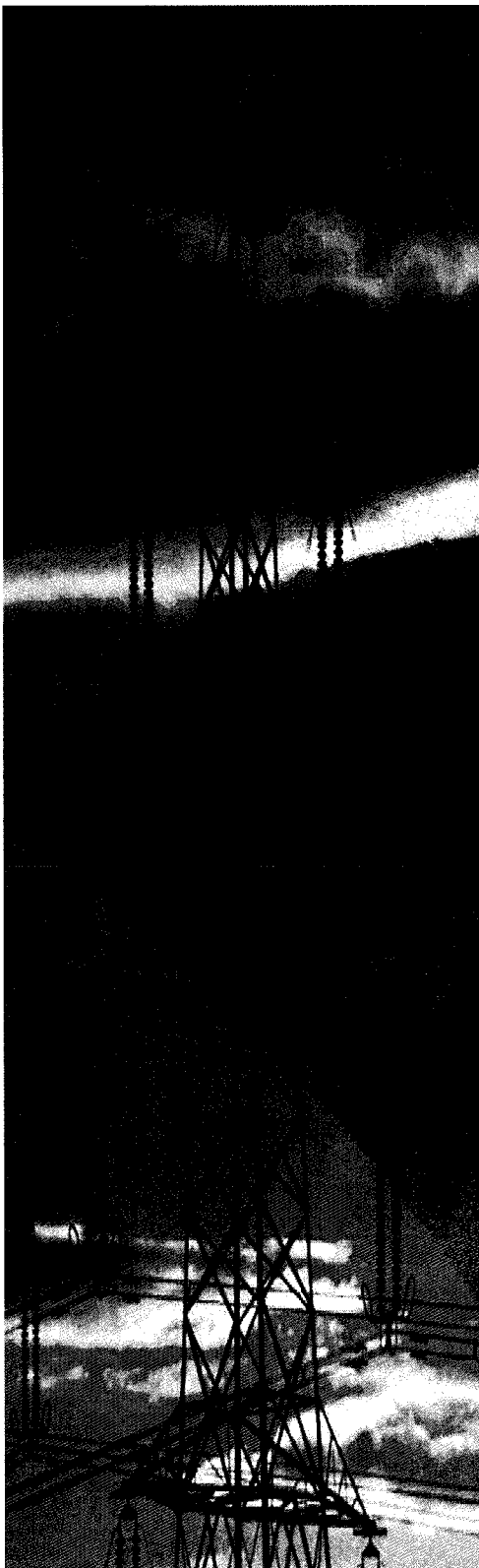
October 15, 2008

Arizona Corporation Commission

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Foreword

This report has been prepared on behalf of the Arizona Corporation Commission ("ACC" or "Commission"). It was prepared in accordance with a contract agreement between K.R. Saline and Associates, PLC ("KRSA") and the Arizona Corporation Commission. It is considered a public document. Use of the report by other parties shall be at their own risk. Neither KRSA nor the Arizona Corporation Commission accepts any duty of care to such third parties.

Arizona's Fifth Biennial Transmission Assessment ("BTA") is based upon ten year plans filed with the Commission by parties in January 2008. It also incorporates information and comments provided by participants and attendees in the BTA workshops and report review process. The ACC Staff and KRSA are appreciative of the contributions, cooperation and support of industry participants throughout Arizona's Fifth Biennial Transmission Assessment process.

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EXECUTIVE SUMMARY

The Arizona Corporation Commission ("ACC" or "Commission") biennially reviews ten year plans filed by parties intending to construct transmission lines, and issues a written decision regarding the adequacy of the existing and planned transmission facilities to reliably meet the present and future needs of the state.¹ Staff of the Utilities Division of the Commission ("Staff"), with the assistance of the consulting firm of KR Saline & Associates, ("KRSA") reviewed and analyzed the ten year plans and related filings, conducted workshops for stakeholder input, and drafted this Fifth Biennial Transmission Assessment ("BTA"). Neither Staff nor KRSA performed any technical studies during this process, but relied upon studies prepared by other parties. Staff and KRSA used an open, transparent and collaborative process to obtain utility and stakeholder input, and engagement.

Staff and KRSA reviewed all ten year plans and filings submitted to Docket No. E-00000D-07-0376. The filings included technical studies previously ordered by the Commission; transmission load serving capability of local load pockets, Reliability Must Run ("RMR") studies, N-1, N-1-1, and extreme contingency studies and an assessment of transmission capacity needed and available to accommodate renewable energy development in Arizona. All entities which made presentations at the first workshop were asked to file the presentations in the docket. Staff and KRSA reviewed these presentations and the transcript of the first and second workshops. The presentations were of high quality and very useful for Staff and KRSA. Two drafts of this Fifth BTA were prepared by Staff and KRSA and made available for industry and stakeholder comments. The collaborative local, subregional and regional transmission planning processes used by individual utilities have resulted in transmission plans which are supported by more detailed technical studies and provide more information than was available in previous BTAs.

This assessment does not establish Commission policy nor does it evaluate individual transmission providers' plans. This BTA assesses the adequacy of Arizona's transmission system to reliably meet the existing and planned energy needs of the state. This BTA is not final unless and until approved by a written decision of the Commission. Staff addressed four fundamental public policy questions during the course of this BTA:

- Does the planned transmission meet the load serving needs of the state during the 2008-2017 timeframe in a reliable manner?

¹ Arizona Revised Statute §40-360.02

- Do the Commission ordered RMR, N-1, N-1-1, Extreme Contingency, and Renewable Energy Transmission Assessment studies comply with, and sufficiently meet, the intended goals of the Commission's orders?
- Did the transmission planning efforts effectively address concerns raised in previous BTAs about the adequacy of the state's transmission system to reliably support the competitive wholesale market in Arizona?
- Did the plans and planning activities comport with transmission planning principles and good utility practices accepted by the power industry and the reliability planning standards established by North American Electricity Reliability Corporation ("NERC") and Western Electricity Coordinating Council ("WECC")?

General Conclusions

Staff offers the following general 2008 BTA conclusions for Commission consideration. More detailed conclusions and the analysis supporting them are provided in section 5 of this report:

1. The current electric utility system in Arizona is adequate and, based upon the assumptions contained herein, should meet the energy needs of the state in 2008 with reliable service.
2. The existing and planned transmission systems serving the Phoenix, Tucson, and Yuma areas are adequate and should reliably meet the local energy needs of the respective areas through 2017.
3. Pinal County is capable of serving 200 to 600 MW of load growth beyond that forecast for 2016. The quantity of load growth that can be accommodated beyond 2016 depends upon whether Western Area Power Administration's ("WAPA" or "Western") local 115 kV lines are upgraded to 230 kV. It would be helpful for future studies of this area to establish simultaneous import limits ("SIL"), maximum load serving capability ("MLSC") and RMR indicators as defined by the Commission.
4. The adequacy level of the Mohave County system is unclear due to controverted conclusions reached in publicly available study reports. It would be helpful for future studies of this area to establish SIL, MLSC and RMR indicators as defined by the Commission.
5. Santa Cruz County and Cochise County are served by radial transmission lines. Growing numbers of customers are, therefore, exposed to extended service interruptions following the loss of a single

transmission line in these two counties. The ability of these two areas to restore service to customers within a reasonable period of time following a transmission line outage has been a long standing concern of the Commission. System improvements that assure "continuity of service" for loss of a single transmission line is a public policy that needs to be adopted to replace the "restoration of service" practice present in these two counties.

6. All Commission required studies have been filed. Arizona Public Service ("APS") and Tucson Electric Power ("TEP") filed RMR studies. Salt River Project ("SRP") filed Southwest Area Transmission Study Group ("SWAT") studies that address Ten Year Snap Shot Studies, N-1-1 contingencies and extreme contingency studies performed by the Central Arizona Transmission Extra High Voltage ("CATS EHV") study group, and the Central Arizona Transmission High Voltage ("CATS HV") Study of Pinal County. SRP also filed a SWAT Renewable Transmission Task Force Report. A supplemental report regarding the renewable task force efforts was filed by APS² in the Docket on August 6, 2008. Southwest Transmission Cooperative Inc. ("SWTC") and TEP have also responded to the requirement that they file transmission plans and analysis addressing specific deficiencies in the Fourth BTA.
 - a. In general the RMR studies show that each RMR area will have sufficient maximum load serving capability to reliably serve the respective area's load during the next ten year period. The RMR studies also indicate local RMR generation will not be dispatched out of merit order for significant hours or yield RMR costs sufficient to warrant advancing transmission improvements. Future RMR studies for Mohave County need to establish SIL, MLSC, and RMR indicators that comport with the Commission's RMR Study Methodology.
 - b. The Ten Year Snap Shot, N-1-1, and Extreme Contingency Studies performed by industry representatives were thorough and well documented, and indicated that the ten year plan is sufficiently robust to provide adequate and reliable service to Arizona.
 - c. The industry's Renewable Transmission Task Force response comports with the Commission's Order. The SWAT report and its supplement report document Available Transfer Capacity ("ATC") data gathered for each utility in Arizona, develops a renewable resource map displaying areas where renewable resource development could potentially occur, and provides a map

² "On behalf of Arizona Transmission Providers: Arizona Public Service Company, Salt River Project, Tucson Electric Power Company, and Southwest Transmission Cooperative, Inc."

depicting new transmission lines that conceptually might be needed to transport energy from the potential renewable resources to the major load pockets in Arizona.

- d. The 2008 TEP RMR Study indicates that even though a Static Var Compensator was installed at Northeast Loop Substation and the Westwing to South 500 kV line was interconnected at Pinal West, the 1,950 MW 2008 SIL is still limited by voltage instability for loss of both Saguaro to Tortolita 500 kV lines.
 - e. SWTC did file a ten year plan that resolved contingency violations that occurred for loss of the Apache to Butterfield 230 kV line, the Butterfield to San Rafael 230 kV line, or the Pantano to Kartchner 115 kV line in its 2015 planning study.
7. Studies indicate that the existing and planned Arizona Extra High Voltage ("EHV") system is adequate to support a robust wholesale market. Six major EHV transmission projects with the potential to improve interstate commerce have been proposed and are accompanied by upgrades to existing EHV facilities that will also enhance increased interstate power transfers and reliable service within the state.
8. Arizona Transmission Providers are engaged in and provide leadership to subregional planning processes. The BTA would not be possible without access to their subregional planning reports and studies. The Federal Energy Regulatory Commission ("FERC") Order 890 requires that individual transmission providers plan their local system via open and transparent processes. New local transmission improvements (115 kV through 230 kV) are now being planned collaboratively in such forums.

Recommendations

Staff offers the following recommendations for Commission consideration and action:

- 1. It is recommended that the Commission continue to support the use of "Guiding Principles for ACC Staff Determination of Electric System Adequacy and Reliability (Appendix A-1) and approve the following steps to foster refinements and improvements in subregional transmission planning forums needed and used for future BTAs:
 - a. Arizona transmission providers are to explore formation of subregional planning forums that assume the responsibility of addressing the local HV and EHV transmission import and RMR

- conditions in Mohave County and Yuma County. Such study forums need to be compatible with and supportive of FERC Order 890 local transmission provider planning obligations.
- b. APS is to file a Yuma County RMR study report with the next BTA that continues to incorporate the plans of all entities proposing to interconnect and do business in Yuma County.
 - c. Unisource Electric ("UNSE") and Mohave Electric Cooperative ("MEC") are to collaborate with other stakeholders and UNSE shall file a Mohave County RMR study report with the next BTA that includes the impacts, influences, and system performance of all proposed local HV and EHV transmission improvements and potential generation interconnections occurring in the area. MEC shall provide all necessary MEC system data to UNSE to perform the RMR study.
2. It is recommended that the SWAT Renewable Transmission Task Force transmission study report and the WestConnect Long Range Planning Study report be filed with the Commission within 30 days of completion to supplement the renewable transmission assessments filed with this BTA.
 3. Staff recommends that the Commission order the following action to resolve concerns within this BTA:
 - a. The Southeast Arizona Transmission Study ("SATS") long range study is envisioned to be completed in 2008. This study is predominantly shaping the ten year plans filed with the Commission for SWTC and TEP. Therefore, a final report is to be filed by TEP on behalf of all SATS participants by January 2009.
 - b. TEP and SWTC are to resolve all "to be determined" (TBD) in-service dates for facilities envisioned to be constructed within the next ten years. The ten year plans filed by TEP and SWTC in January 2009 are to incorporate such resolved in-service dates. Plans that fall beyond the ten year horizon may be included in subsequent ten year plan filings but need to be identified as not occurring within the ten year horizon if a TBD date designation is used.
 - c. UNSE is to perform studies and file a report of those studies for the next BTA that establishes a long range system plan for Santa Cruz County that is founded on the principle of continuity of service following a transmission line outage. Elements of that plan are to be incorporated in the UNSE ten year plans with a defined in-service date and filed with the Commission in January 2009.

- d. APS, Sulfur Springs Valley Electric Cooperative ("SSVEC"), and TEP are to perform collaborative studies and file a report of those studies for the next BTA that establishes a long range system plan for Cochise County that is founded on the principle of continuity of service following a transmission line outage. SWTC shall participate in the study effort as SSVEC's current sole transmission service provider. Relevant elements of that plan are to be incorporated in each transmission provider's respective ten year plan with a defined in-service date and filed with the Commission in January 2010.

1. OVERVIEW

1.1 Assessment Authority

Arizona statutes require every entity considering construction of any transmission line equal to or greater than 115 kV within Arizona during the next ten year period to file a ten year plan with the Arizona Corporation Commission ("ACC" or "Commission") on or before January 31 of each year.³ Every entity considering construction of a new power plant of 100 Megawatts ("MW") or greater within Arizona is required to file a plan with the Commission 90 days before filing an application for a Certificate of Environmental Compatibility ("CEC").⁴ All such plans filed with the Commission must include power flow and stability analysis reports showing the effect of the planned facilities on the current and future Arizona electric transmission system.⁵ The Commission is required to biennially examine the plans and "issue a written decision regarding the adequacy of the existing and planned transmission facilities in Arizona to meet the present and future energy needs of the state in a reliable manner".⁶

1.2 Fifth Biennial Assessment – Purpose and Framework

The purpose of this report is to inform the Commission of currently planned transmission facilities and offer an assessment of the adequacy of the existing and planned Arizona electrical transmission system. This Fifth Biennial Transmission Assessment ("BTA") evaluates the ten year transmission plans filed with the Commission in January 2008.⁷ This report fulfills the statutory obligation to review these transmission plans and assess whether the Arizona transmission system is and will remain adequate throughout the ten year timeframe.

The Commission ordered that supplemental study work also be performed by the industry as a portion of this fifth BTA.⁸ These include Reliability Must Run ("RMR"), N-1-1 and extreme contingency studies required from prior ACC Biennial Transmission Assessments. The Commission also required an

³ Arizona Revised Statute § 40-360.02.A

⁴ Arizona Revised Statute § 40-360.02.B

⁵ Arizona Revised Statute § 40-360.02.C.7

⁶ Arizona Revised Statute § 40-360.02.G

⁷ Docket No. E-00000D-07-0376

⁸ Decision No. 69389, Docket No. E-00000D-05-0040

assessment of transmission capacity available or required for renewable energy development in Arizona. This report examines the transmission plan adjustments made by the industry to address the concerns identified by Staff in the first four BTAs and the Commission ordered studies.⁹

In the Arizona BTA process, entities conduct their own technical studies, participate in collaborative and open regional planning processes, and present the study results in their ten year plan reports and at public workshops. Commission staff ("Staff") relies on the technical reports and documents filed with the Commission and other publicly available industry reports rather than performing independent technical study work. Staff continues to use a set of guiding principles to aid it in determining the adequacy and reliability of both transmission and generation systems.¹⁰ Staff's guiding principles are based upon best engineering practices established in Arizona coupled with the use of Western Electricity Coordinating Council ("WECC") and North American Electricity Reliability Corporation ("NERC") planning standards.¹¹

Staff retained K.R. Saline and Associates, PLC ("KRSA") to assist them with this Fifth BTA. Staff and KRSA critically reviewed and analyzed the assembled transmission planning reports and the filed ten year plans and addressed the following four key public policy questions:

1. Do the proposed Arizona transmission system plans meet the load-serving requirements of the state during the 2008-2017 timeframe in a reliable manner?
2. Are the required Reliability Must Run, N-1-1, Extreme Contingency, and Renewable Energy Transmission Assessment studies compliant with, and sufficiently meet, the intended goals of the Commission's orders?
3. Were steps taken in the most recent transmission planning studies to effectively address concerns raised in previous BTAs about the adequacy of the state's transmission system to reliably support the competitive wholesale market in Arizona?

⁹ History of Commission Ordered Studies, Appendix B.

¹⁰ Guiding Principles for ACC Staff Determination of Electric System Adequacy and Reliability: Appendix A - Arizona's Best Engineering Practices, Jerry D. Smith, ACC, pre-filed comments for the Gila Bend Power Plant Hearing, Docket No. E-00000V-00-0106, November 9, 2000

¹¹ Reliability Criteria, Revised April 2005, "NERC/WECC Planning Standards" Section - Revised April 10, 2003, <http://www.wecc.biz/documents/library/procedures/CriteriaMaster.pdf>

4. Do the processes utilized comport with transmission planning principles and good utility practices accepted by the power industry and the reliability planning standards established by NERC and WECC?

1.3 Assessment Process

A three-stage approach was used to prepare the fifth BTA report. The first stage consisted of a workshop which offered participants the opportunity to make presentations supplementing their ten year plan filings. During the second stage, Staff and KRSA prepared, distributed and posted to the Commission's website the first draft report for public comment. A second draft of the report was prepared and posted on the website in response to the public comments received. The third stage of the process consisted of a second workshop for Staff and KRSA to present and facilitate discussion of the second draft of the report. A summary of each stage of the BTA process is described in the following sections.

1.3.1 Workshop I: Industry Presentations

KRSA assisted Staff in arranging a two-day public Workshop on May 22-23, 2008 at the Industrial Commission's auditorium in Phoenix, Arizona. A complete listing of the Workshop I attendees and presenters is in Appendix E. Transmission Providers and Subregional Planning Groups presented information regarding their respective transmission expansion plans and related planning activities. Merchant transmission and generation developers reported on their respective development plans.

The Workshop provided an informal setting to promote effective discussion of each presentation.¹² Prior to the Workshop each presenter was provided an advance list of questions as outlined in Appendix D. Each presentation was followed by an open period of discussion including questions and comments from the audience. Staff and KRSA concluded the session with general comments and observations and noted the following action items:

1. All parties making presentations were requested to file a paper copy of their presentations in Docket Control.

¹² The Workshop I agenda and presentation materials are located at <http://www.cc.state.az.us/divisions/utilities/electric/biennial.asp>

2. Southern California Edison ("SCE") agreed to file all reports referenced in their presentation that had not been previously filed in Docket Control.
3. Salt River Project ("SRP") agreed to file a summary of the extra high voltage ("EHV") transmission upgrades that have been and are occurring in Arizona as it relates to transmission path rating increases. That summary is to reference the WECC reports supporting those new ratings.
4. Western Area Power Administration ("WAPA" or "Western") agreed to provide a letter in response to two questions posed regarding their transmission plan:
 - a. The "Central Arizona Transmission Study ("CATS") EHV Ten Year Snapshot and N-1-1" presentation indicates that the "N-1 contingencies overload conditions associated with WAPA's transmission elements were not resolved." The question posed was – "were Western's planned upgrade of 115 kV lines to 230 kV modeled as 230 kV lines in the 2016 case and if not would doing so have resolved the overloads?" The context of this question relates both to the WAPA system in Pinal County and along the Colorado River.
 - b. The status and modeling of the San Luis Rio Colorado generation project and North Branch 230 kV lines were questioned during the Yuma RMR study presentation. Arizona Public Service ("APS") confirmed the projects were modeled in the study. The projects are not reflected in WAPA's ten year plan provided to the Commission. What is the current status of these projects?
5. APS agreed to file a supplement or update to the "2007 Southwest Area Transmission ("SWAT") Renewable Energy Transmission Task Force Report" that encompasses and documents the detail and breadth of information contained in the Workshop I presentation.
6. APS agreed to file before the second BTA Workshop an explanation of what has been done to address California's Market Redesign and Technology Upgrade ("MRTU") tariff impact on transmission seams issues with neighboring states.

1.3.2 Preparation of Draft Report and Industry Comment

Staff and KRSA provided an initial draft of the 2008 BTA report for industry review and comment in July 2008. The first draft report was based on the docketed ten year plans and information gathered at

Workshop I.¹³ The first draft report was placed on the Commission's website and distributed via industry distribution lists to expedite the review process. Industry comments were collected and docketed for other parties review, comment and response during the three week review timeframe. A second draft of the report was then prepared by Staff and KRSA in response to received comments. The docketed comments and the second draft of the report were the subject of Workshop II.

1.3.3 Workshop II: Staff/KRSA Presentation of Final Report

The second 2008 BTA Workshop was held at the Industrial Commission's auditorium on September 18, 2008. The purpose of this second workshop was to present the second draft of the Fifth BTA report and present responses to comments submitted during the first draft review period. A complete listing of the Workshop II attendees and presenters is located in Appendix E.

During Workshop II, Staff and KRSA made a presentation¹⁴ summarizing Workshop I action items and comments received during the review period. All Workshop I action items are now complete with Staff's receipt of a September 23, 2008, letter regarding action Item 4. The material provided in response to all action items has been incorporated and referenced in this report. Of particular interest are the transmission path upgrade summary provided by SRP, the California MRTU seams issues impact assessment report provided by APS, and the supplemental Arizona Renewable Task Force Report filed by APS. Each document is available through E-docket and is cited at appropriate locations later in this report.

Comments on the first draft of the Fifth BTA report were received from 11 entities. The parties commenting on the first draft BTA report are listed in Table 1. Their comments were docketed and are available via the ACC's E-docket system. A majority of the comments concerned the subtleties of this BTA's adequacy determination of Arizona's transmission system. A summary of the filed comments and responses to the first draft report are outlined in the Workshop II presentation.¹⁵ The filed comments and Workshop II attendees' oral comments provided valuable feedback and resulted in refinements in this final Fifth BTA report.

¹³ Transcripts of May 22-23, 2008 Workshop I are available at the ACC Docket Control

¹⁴ Staff and KRSA Workshop II presentation
<http://www.cc.state.az.us/divisions/utilities/electric/biennial.asp>

¹⁵ Ibid

Table 1 - List of Parties Commenting on First Draft Report

Arizona Public Service
Interwest Energy Alliance
Robert S. Lynch and Associates
Salt River Project
SkyFuel
Southwest Transmission Cooperative
Southwestern Power Group
Sulphur Springs Valley Electric Cooperative
Tucson Electric Power / UniSource Electric
Western States Energy Solutions

2. TEN YEAR PLANS

The entities listed in Table 2 filed ten year transmission plans with the Commission in January 2008. The ten year plans for proposed power plants and their associated transmission lines must be filed annually after the initial filing occurs 90 days in advance of the date an application for a Certificate of Environmental Compatibility ("CEC") is filed with the Commission. This assessment examines the aggregate of these ten year plans.

Table 2- List of Parties Filing Ten Year Plans -January 2008

Arizona Public Service Company	Southwest Transmission Cooperative
Gila Bend Power Partners	Southwestern Power Group
Dynegy	Salt River Project
El Paso Electric Company	Tucson Electric Power
Public Service Company of New Mexico	UniSource Electric
Santa Cruz Water and Power Districts	Wellton-Mohawk Irrigation & Drainage District
Southern California Edison	Western Area Power Administration (DSW) ¹⁶

Individual utilities within the state of Arizona plan and design their bulk transmission systems in accordance with the NERC/WECC Regional Reliability Standards for System Planning and WECC Minimum Operating Reliability Criteria, guidelines established at the state level, and their own internal planning criteria, guidelines and methods. These planning practices are utilized to ensure that their respective systems are planned to provide reliable service to customers under various system conditions. These requirements are also intended to ensure that neighboring utilities and neighboring states plan their systems in a coordinated manner by following a consistent set of standards, criteria and guidelines.

A portion of Workshop I included presentations regarding projects for which no ten year plan was filed. These projects include; High Plains Express Initiative, Diné Power Authority's Navajo Transmission Project and Central Arizona Water Conservation District's ("CAWCD") Harcuvar Project. While these projects are described in this report, they were not considered as elements of the ten year plans for which this BTA makes an adequacy determination.

¹⁶ The WAPA-Desert Southwest ("DSW") plan was not formally filed but a courtesy copy was provided by a transmittal letter

2.1 Summary of Arizona Plan

The BTA examines the aggregation of all of the docketed projects as a coordinated transmission system expansion plan for Arizona. Therefore, this report presents the transmission projects from a system perspective without regard to sponsorship or ownership. Projects that have not been filed are not included in this adequacy analysis for the BTA. However, they are depicted with all other projects on maps provided as Exhibits 1-6. These projects are also depicted as an integral part of an online map of the 2007 WestConnect Ten Year Plan.¹⁷ Maps and a tabular listing of each filing entity's projects are located in accordance with Table 3 below.

Table 3 - Entities Ten Year Plan Reference Table

Entity	Reference Location
Arizona Public Service	Exhibit 22
Gila Bend Power Partners	Exhibit 25
Dynegy	Exhibit 23
El Paso Electric	Exhibit 24
Public Service of New Mexico	Exhibit 26
Santa Cruz Water and Power Districts	Exhibit 28
Southern California Edison	Exhibit 29
Southwest Transmission Cooperative	Exhibit 31
Southwestern Power Group	Exhibit 30
Salt River Project	Exhibit 27
Tucson Electric Power	Exhibit 32
UniSource Electric	Exhibit 33
Wellton-Mohawk Irrigation and Drainage District	Exhibit 34

The ten year plan projects are also listed in tabular form and have been sorted by in-service date and voltage class respectively in Exhibits 20 and Exhibit 21.

Table 4 depicts the number of new transmission projects and associated mileage for each year of the ten year plans. Projects with a to-be-determined ("TBD") in-service date or that are beyond the Ten Year Plan timeframe have been grouped together as a single category. Phased projects with differing in-service dates for the respective phases were tabulated as separate projects. Table 5 depicts the number of Arizona Plan projects by voltage class. Table 5 depicts projects with multiple voltage class lines or for

¹⁷ WestConnect website, http://westconnect.com/planningmap_sm.php

which the voltage class has not been resolved are reported at the highest voltage class identified for the project.

Table 4 - Summary of Plan by In-Service Date

In-Service Date	Number of Projects	Mileage
2008	7	131
2009	8	21
2010	16	239
2011	11	393
2012	9	137
2013	12	689
2014	2	60
2015	0	0
2016	2	20
2017	1	4
Subtotal	68	1,694
Post 2017 and TBD	61	1,296
Total	129	2,990

Table 5 - Summary of Plan by Voltage Class

Voltage Class	Number of Projects		Mileage
	2008 to 2017	Post 2017 and TBD	
500 kV	12	6	1,324
345 kV	6	12	578
230 kV	15	25	536
138 kV	23	17	488
115 kV	12	1	64
Total	68	61	2,990

The aggregate Ten Year Plan of the 14 filing entities consists of 68 transmission projects of approximately 1,694 miles in length, as shown in Table 4. An additional 8 projects are beyond the ten year horizon and the in-service dates of 53 projects are yet to be determined. There are few projects filed with an in-service date in the 2014-2017 timeframe. This phenomenon is somewhat typical in transmission planning in that the planning years 6-10 are often not studied except in a tenth year case and as a result do not get the staging scrutiny of the first 5 years of the plan. Also notable is the significant increase in the number of 115 kV, 138, kV and 345 kV projects in Table 5 over those identified in the Fourth BTA. This increase is largely attributable to the planning work performed by the Southeast Arizona Transmission Study ("SATS") group during the last two years.

The aggregate Ten Year Plan includes a significant number of 500 kV projects, as shown in Table 5. Most of the 500 kV total transmission miles are attributable to four transmission projects: Palo Verde-Devers #2, SunZia, Palo Verde-North Gila #2 and Palo Verde-Saguaro projects which account for 970 of the 1,324 of the 500 kV miles displayed in Table 5 above. The large number of 138 kV and 230 kV projects is an indicator of the local utility's need to access the available transmission capacities on planned 345 kV and 500 kV for local load serving purposes.

2.2 Plan Changes from Fourth BTA

Transmission plans inevitably evolve over time and are in a constant state of flux. Significant changes can occur as a result of regulatory changes, siting and permitting challenges, shifts in load forecasts, identification of new generating plants, interconnection requests, and changes in the economic or financial climate faced by the utility.

Some previously planned projects have actually been constructed while others have been eliminated from consideration. The in-service date of some projects has changed and new projects have been added. Some projects or proposed substations have undergone a name change since the last BTA. Such a change makes it difficult to track projects through a cyclical process such as the BTA. Therefore, a table of name changes is provided below in Table 6. Table 7 summarizes 500 kV and 345 kV project changes since the last BTA.

Table 6 – Project Name Changes or Aliases

Current Name	Formerly Known As
Delany	Harquahala Junction
Sun Valley	TS5
Pinal Central	Pinal South
Dinosaur	RS19
Trilby Wash	TS1
Sugarloaf	Second Knoll
Abel	Southeast Valley ("SEV")

Table 7 – Significant EHV Project Changes Since Fourth BTA

In-Service Date	Project	Voltage Class	Status
2010	PV Hub-Sun Valley 500kV	500 kV	Changed In-Service date from 2009 to 2010
2011	Pinal Central-Tortolita Substation	500 kV	New Project - 2011
2011	Pinal West-Abel/Browning	500 kV	New Project - 2011
2011	Palo Verde-Devers #2	500 kV	Changed In-Service date from 2009 to 2011
2012	Series Capacitor Upgrade Project - Moenkopi-Eldorado 500kV	500 kV	Changed In-Service date from 2010 to 2012
2013	SunZia Project	500 kV	New Project - 2013
2010	Flagstaff 345/69kV interconnection	345/69 kV	Changed In-Service date from 2009 to 2010
2014	Tortolita-Vail (thru North and East Loop)	345 kV	New Project - 2014

(A more detailed listing of all other changes from the Fourth BTA is provided in Exhibit 18.)

2.3 2008 Summer Preparedness

The *Summer 2008 Energy Preparedness* Open Meeting occurred on March 22, 2008, at the Arizona Corporation Commission offices. The Energy Preparedness meeting is an open meeting where electric utilities inform the Commission of their level of preparedness to deal with the ensuing summer peak season. The 2008 summer preparedness meeting included presentations by APS, SRP and TEP, and was followed by public comment. APS, SRP and TEP each indicated preparedness for the 2008 summer peak demand. This preparedness included a declaration of adequate generation and reserves and sufficient transmission capacity to withstand normal outage contingencies. Emergency plans are also in place to respond to extreme outage events, extreme system conditions and events of nature such as storms or fires.

Staff and KRSA were in attendance at the Summer Preparedness open meeting and heard the three utilities presentations to the Commission. APS indicated it is well prepared for the up-coming 2008 summer demand. APS stated adequate generation resources are in place to meet customer load and meet reserve requirements, transmission capacity is in place to import remote generation and purchases, distribution infrastructure improvements are on schedule to meet customer loads and emergency action plans are in place to respond to extreme conditions.¹⁸ SRP indicated that SRP transmission, distribution, generation and planned energy purchases are adequate to serve the forecasted year 2008 demand and that contingency plans are in place to handle emergency events.¹⁹ TEP summarized its presentation noting that sufficient generation resources are available to meet both TEP's and UNSE's load. TEP stated that sufficient transmission is available to import remote generation and resources for TEP and UNSE Mohave and Santa Cruz, and that plans are in place for UNSE to respond to extreme conditions.²⁰

The 2008 level of preparedness of the three major utilities in Arizona appears to be high and above the norm. None of the concerns that have existed in prior summer preparedness open meetings over the

¹⁸ APS, *Arizona Public Service Company 2008 Summer Assessment*, given on March 19, 2008, slide 42, http://www.azcc.gov/Divisions/Utilities/Electric/summer_preparedness/APS%202008%20Summer%20Assessment%203-20-08.ppt

¹⁹ SRP, *Summer Preparedness 2008 Presentation*, given on March 19, 2008, slide 13, http://www.azcc.gov/Divisions/Utilities/Electric/summer_preparedness/SRP%20Summer%20Preparedness%202008%203-19-08%20-%20Final.pdf

²⁰ TEP, *2008 ACC Summer Preparedness Hearing*, given on March 19, 2008, slide 18, http://www.azcc.gov/Divisions/Utilities/Electric/summer_preparedness/TEP-UNSE%202008%20Summer%20Preparedness%203-19-08.ppt

past decade were present in 2008. The current electric utility system in Arizona is judged to be adequate to meet the energy needs of the state in 2008 with reliable service. However, the summer preparedness of Arizona Electric Power Cooperative ("AEPCO") and its affiliate Southwest Transmission Cooperative ("SWTC") was not addressed in the 2008 Summer Preparedness Open Meeting. It may be appropriate to include AEPCO and SWTC in future summer preparedness assessments, given the number of Arizona distribution cooperative customers served by these entities.

2.4 Interstate, Market, Merchant, and Generation Transmission Projects

In the Western Interconnection interstate transmission is essential to enabling a state's utilities access to the wholesale market for purchases and sales. Interstate and market driven transmission projects facilitate a more robust and viable wholesale market. Interstate and merchant transmissions projects complement the states' utilities electric infrastructure and allow for additional import/export points. Several market access projects and merchant transmission projects are discussed in this BTA. Such projects are essential for local load serving entities and new merchant power plants. These projects permit access to the wholesale market without reliance on transmission services over existing transmission providers' systems which may have limited long term available transmission capacity. This section of the BTA report highlights the status of ten such planned projects that affect Arizona.

2.4.1 Navajo Transmission Project

The Navajo Transmission Project ("NTP") is a merchant 500 kV transmission line project with an approximate total length of 478 miles.²¹ The line will extend from a new substation located near the Four Corners Power Plant in northwestern New Mexico to the Marketplace Substation south of Boulder City, Nevada. A new Desert Rock power plant will interconnect to the line in New Mexico near Four Corners. The NTP will be constructed in three segments which traverse Arizona.

- Segment 1 – 198 mile 500 kV single circuit transmission line from Desert Rock Generating Facility in northwestern New Mexico to the proposed Red Mesa West Substation in northern Arizona. The WECC path rating process began in January 2006 for Segment 1 of NTP. Segment 1 will begin construction in 2009 and the planned in-service date for Segment 1 is the fourth quarter of 2011.

²¹ CEC Case#103, Docket No. L-00000U-00-0103, approved under Decision #63197

- Segment 2 – 62 mile 500 kV single circuit transmission line from a new Red Mesa West substation to the existing Moenkopi Substation. This segment generally parallels an existing Glen Canyon to Flagstaff 345 kV transmission line corridor. Project schedule is yet to be determined.
- Segment 3 – 218 mile 500 kV single circuit transmission line from the existing Moenkopi Substation to the existing Marketplace Substation. Segment 3 generally parallels an existing Moenkopi to El Dorado 500 kV transmission line. Project schedule is yet to be determined.

No ten year plan was filed for this project. Therefore, this project was not considered as the adequacy analysis and ten year plan statistics were compiled for this BTA. However, an update of this project was provided at the May 22, 2008 BTA Workshop I. This project has been complying with the WECC regional project planning and path rating process requirements. An overview map showing the general routing of each segment is included as Exhibit 9.

2.4.2 Palo Verde to Devers No. 2 500 kV Transmission Line

The Palo Verde to Devers No. 2 ("PVD2") 500 kV Project²² is a SCE sponsored interstate transmission project. An overview map showing the general routing of the PVD2 transmission line is included as Exhibit 10. This project consists of two major transmission line segments:

1. **Segment 1 - Delany to Devers:** - A new 500 kV transmission line between Arizona and California; Delany²³ to Devers Substations respectively. This segment is approximately 230 miles long. Approximately 102 miles is in Arizona and the remaining 128 miles are located in California. The planned transmission line routing parallels the existing Palo Verde to Devers 500 kV transmission line.
2. **Segment 2 - Devers to Valley No. 2:** - A new 500 kV transmission line connecting SCE's Devers and Valley Substations (located entirely in California). This segment is approximately 41.6 miles long. The planned transmission line routing parallels the existing Devers to Valley 500 kV transmission line.

²² ACC Docket No. L-00000A-0295-00130

²³ Delany Substation was previously known as Harquahala Junction

On June 6, 2007, the Arizona Corporation Commission denied SCE's application for a CEC for the PVD2 transmission line.²⁴ Despite that CEC denial, SCE states its first priority and preference is to gain regulatory approval for the proposed transmission project from the ACC. SCE filed a new ten year plan with the ACC in January 2008. In support of a new CEC filing, SCE is working with stakeholders, regional utilities and planning groups in Arizona to develop a mutually acceptable alternative plan to present to the ACC for approval of the project. SCE is working with Arizona stakeholders to reconfigure PVD2 to provide tangible Arizona benefits. SCE is performing new technical studies in the SWAT/Colorado River Transmission ("CRT") forum to consider interconnection of a western Arizona substation to integrate renewables and connect with Central Arizona Project pump load. Feasibility studies have been completed and are described in the Harcuvar Project Section of this report. Steps are now being taken to determine Arizona benefits associated with the western Arizona interconnection with the PVD2 project.

SCE is simultaneously pursuing a second approach to secure regulatory approval. On May 16, 2008, it filed a pre-filing application with Federal Energy Regulatory Commission ("FERC") under Section 50.6 - Transmission Line Siting process. This filing triggers a project-wide National Environmental Policy Act ("NEPA") review, preparation of a preliminary draft Environmental Impact Study ("EIS"), and a public notice process along the entire right-of-way. Open house meetings concerning the revised scope of the project commenced in Arizona in June 2008. The Arizona Corporation Commission has responded to this FERC filing.²⁵

2.4.3 Harcuvar Project

Harcuvar is a proposed 230 kV transmission project located approximately 60 Miles west of the Palo Verde Hub and is sponsored by Central Arizona Water Conservation District ("CAWCD"). No ten year plan has been filed with the Commission for this project. Therefore, this project was not considered for the adequacy analysis nor included in the ten year plan statistics compiled for this BTA. This project was presented and discussed at the May 22, 2008 BTA Workshop. An overview map showing the general routing and interconnection points of this project are included as Exhibit 11.

The proposed project is a result of the Central Arizona Project's ("CAP") desire to improve its system reliability and SCE's desire to construct the PVD2 transmission line. The project could provide access to

²⁴ ACC Decision No. 69638

²⁵ <http://elibrary.ferc.gov/idmws/nvcommon/NVViewer.asp?Doc=11687511:0> and
<http://elibrary.ferc.gov/idmws/nvcommon/NVViewer.asp?Doc=11709962:0>

Arizona renewable generation as well as transmission access to the Palo Verde Hub and to California. The Harcuvar Project is planning an open season to solicit project participants interested in renewable and fossil fuel generation interconnection.

Studies for this project are being managed by the CRT subregional planning study group. Feasibility study work for this project has been completed with a number of study scenarios based upon a power flow case approved by nine CRT study team participants. The results are outlined in the Harcuvar presentation²⁶ for BTA Workshop I. A report detailing the study results will be prepared by the CRT study team prior to 2009.

Most of the project will utilize existing federal right of way and designated utility corridors. Nevertheless, the Harcuvar project is dependent upon the presence of the planned PVD2 500 kV line and the following new transmission elements:

- Interconnection to both Palo Verde to Devers 500 kV lines at a proposed Salome Substation.
- Five miles of new 230 kV transmission line from the Salome Substation to CAWCD's existing Little Harquahala Substation.
- A new 115/230 kV double circuit transmission tie between the existing CAWCD Bouse Hills and Little Harquahala Substations (following the existing Central Arizona Project right-of-way).

2.4.4 San Luis Rio Colorado Plant and North Branch Transmission Project

A Mexican company called Generadora del Desierto, a wholly owned subsidiary of North Branch Holding Company, is proposing to construct a 600 MW gas fired combined cycle power plant in Mexico just south of the US/Mexico border south of Yuma, AZ. The plant will interconnect in the US via the North Branch Transmission Project which consists of two 230kV transmission lines which will connect to a new 230kV substation to be built next to WAPA's Gila 161kV substation. The new double circuit 230kV lines will continue to the APS North Gila 500kV station. Negotiations are currently underway to share the North Branch 230kV facilities with APS to avoid redundancy of facilities to serve APS loads in the Yuma area.

²⁶ 2008 BTA Workshop I, *Harcuvar Presentation*, May 22, 2008

The Environmental Impact Study (EIS) for the transmission lines was performed by WAPA and the Record of Decision ("ROD") was forwarded to the US Department of Energy ("DOE") for their review in preparing and issuing a Presidential Permit. On August 21, 2008, the DOE published, in the Federal Register, notice of its decision to issue a Presidential Permit to Generadora del Desierto to construct, operate, maintain and connect a new double circuit 230kV transmission line across the U.S.-Mexico border into Yuma County, southeast of San Luis, Arizona.²⁷

2.4.5 Wellton-Mohawk Project

The Wellton-Mohawk project is a 230 kV transmission project interconnecting to the planned Palo Verde to North Gila No. 2 500 kV project. A 500/230 kV receiving station will interconnect with the planned 500 kV line approximately 40 miles east of the North Gila Substation. Wellton-Mohawk plans on constructing a 230 kV transmission line from that receiving station through the Wellton-Mohawk service area and interconnecting to the existing WAPA Ligurta Substation. In addition to the 230 kV transmission line, Wellton-Mohawk plans on constructing a new 230/69 kV substation to provide additional load serving capability to the eastern side of the Wellton-Mohawk electric service territory and to provide reliable electric service to a proposed oil refinery within the Wellton-Mohawk electric service territory. An overview map showing the general routing and interconnection points of this project are included as Exhibit 12.

The Wellton-Mohawk Project reported that it has performed preliminary feasibility power flow analysis, but the final report has not yet been completed. Therefore, no power flow or stability studies were filed with their ten year plan. The Wellton-Mohawk 230 kV transmission project stakeholder input has previously been limited to the refinery developers, potential resource suppliers and the participants in the Palo Verde - North Gila No. 2 Project. Detailed power flow and stability analysis will be performed once the load characteristics (oil refinery and associated ancillary loads) are more well defined.

2.4.6 Santa Cruz Water and Power District – Three Terminal Plan

The ten year plan filed by the Santa Cruz Water and Power District ("SCWPD") includes a transmission project associated with a Southwest Public Power Resources ("SPPR") group generation project. SPPR is a diverse group of entities widely spread across Pinal County and other locations in

²⁷ Federal Register / Vol. 73, No. 163/ Thursday, August 21, 2008/Notices, page 49447.
<http://edocket.access.gpo.gov/2008/pdf/E8-19392.pdf>

Arizona that are participating in resource development. SCWPD is a participant in SPPR's resource development and associated transmission improvement efforts.

The Three Terminal Plan ("TTP") transmission project filed by SCWPD is needed to interconnect SPPR's Generation Project No. 1 located in Pinal County and deliver power to the SPPR participants. The SPPR Generation Project No. 1 is tentatively planned as a 2-on-1 combined cycle gas-fired generating plant rated at approximately 620 MW. Multiple generation sites were under consideration at the time of SCWPD filing its ten year plan. An overview map showing the general routing and interconnection points of this transmission project are included as Exhibit 13. The TTP project consists of the following transmission elements:

- **A 230 kV line from Santa Rosa/Test Track to a new ED5 230 kV substation:**
A 230 kV circuit will be added on the SEV 500 kV line from Santa Rosa to Thornton Road; then a portion of WAPA's Casa Grande to Empire to Saguaro 115 kV line will be converted to a double circuit 230 kV line from Thornton Road to a new ED5 230 kV substation. WAPA's circuit will continue to operate at 115 kV.
- **A 230 kV line from the new ED5 230 kV substation to Pinal Central 230 kV:**
WAPA's existing ED5 to ED4 to ED2 115 kV line will be converted to a double circuit 230 kV line. WAPA's circuit will continue to operate at 115 kV.
- **A 230 kV line from the new ED5 230 kV substation to a new Marana 230 kV substation:**
The remaining portion of WAPA's 115 kV line from Empire to Saguaro and its 115 kV line from Saguaro to Marana Tap will be converted to a double circuit 230 kV line. WAPA's circuit will continue to operate at 115 kV.
- **A double circuit 230 kV line from Pinal Central to a "Randolph" generation site, OR minimal 230 kV transmission requirements to interconnect other potential generation sites in close proximity to the TTP project.**

No power flow or stability studies were filed with the ten year plan in support of this project. However, power flow studies were filed with Commission Staff on June 30, 2008, for that portion of the TTP project that would be subject to Condition 23 of Decision No. 68093. In addition, extensive resource planning studies, several purchased power solicitations and a comprehensive siting study have been performed. Detailed power flow analyses have been performed for three short-listed generation sites.

Preliminary short circuit and stability analyses have been performed for two of the potential sites. Results of all these additional studies will remain confidential pending final site selection. The SPPR Group members who are also participants in the Southeast Valley ("SEV") transmission project have requested that SRP perform a study of new generation in the general proximity of Pinal Central and the planned TTP transmission project. SRP reported at the BTA Workshop II that any needed studies would be performed by the CATS HV study group.

2.4.7 Bowie Power Station

The Bowie Power Station owned by Southwestern Power Group ("SWPG") is a natural gas fired 1,000 MW electric generation facility planned for southeastern Arizona near the community of Bowie in Cochise County. The Bowie Power Station and associated transmission project were issued Certificates of Environmental Compatibility.²⁸ Construction of the first 500 MW unit is expected to begin in 2008, with commercial operation expected by 2011. The ten year plan filed in January 2008 was not accompanied by power flow or stability studies.

The Bowie Power Station interconnects with TEP's 345 kV transmission system at Willow Substation via two 345 kV transmission lines. An overview map showing the general routing and interconnection points of this transmission project are included as Exhibit 14. SWPG participates in regional transmission planning forums, SWAT and its subcommittees, and ongoing activities of WestConnect. SWPG filed an interconnection request for the Bowie Power Station with TEP and reported that the following technical study work has been completed or is scheduled:

- A System Impact Study ("SIS") has been completed and a report was issued by TEP.²⁹ A Facility Study ("FS") was initiated March 2008 and is to be completed in the third quarter of 2008.
- An Interconnection Agreement ("IA") with TEP will be executed and filed with the ACC in the third quarter of 2008.
- A Transmission Services Agreement will be executed with TEP in the first quarter 2011.

²⁸ ACC Decision Nos. 64625 and 64626 issued on March 7, 2002 and Decision No. 69339 issued on February 20, 2007

²⁹ http://www.oatiaoasis.com/TEPC/TEPCdocs/Bowie_PS_Project_500_MW_GIS--FINAL_REPORT.pdf

2.4.8 SunZia Southwest Transmission Project

SunZia is a 500 kV interstate transmission project sponsored by Southwestern Power Group between Arizona and New Mexico. An overview map showing the general routing of the line is included as Exhibit 15. As stated in the June 2, 2008 SunZia press release³⁰, "SunZia will provide new delivery paths to electricity markets for existing and developing energy resources, primarily renewable resources such as wind, solar and geothermal projects in both states. Through strategic interconnections, customers in Arizona, New Mexico, Nevada and California will have access to these new resources to help meet their local power needs. SunZia will also substantially improve the efficiency and reliability of power transfers across the transmission grid in the West."

The SunZia ten year plan filed in January 2008 was not accompanied by power flow or stability studies. However, SunZia reports that it is involved in the regional and subregional planning process through the following forums and activities:

- **WECC** — Regional Project Planning was initiated on December 15, 2006. A draft Regional Planning Project Report ("RPPR") was issued on March 16, 2007, and a final RPPR was issued to WECC on May 17, 2007. WECC issued acceptance of RPPR on July 12, 2007.
- **Subregional Planning** — Regular project updates are provided to SWAT and its subcommittees.
- **Open Season** — An Open Season was announced on December 15, 2006, and attracted thirty interested parties. An initial meeting was held on February 16, 2007. A participation agreement was signed by five parties and reported on June 2, 2008.³¹

2.4.9 High Plains Express Initiative

The High Plains Express is a participant led, multi-state, 500 kV transmission initiative from Wyoming to Arizona. Currently Xcel Energy and Trans-Elect Development Company are co-managing the participant's efforts and committee coordination. A ten year plan has not been filed with the Commission for this project. Therefore, this project was not considered for the adequacy analysis nor included in the ten year plan statistics compiled for this BTA. This project was presented and discussed at the May 22,

³⁰ SunZia Southwest Transmission Project Press Release, WestConnect Website, June 2, 2008

³¹ <http://www.sunzia.net/news.php>

2008 BTA Workshop. An overview map showing the general routing and interconnection points of this project are included as Exhibit 16.

The High Plains Express transmission project is envisioned to provide the primary regional benefits of reliability improvements, access to multiple locations of generation resources in several states and provides a roadmap for regional transmission expansion. High Plains Express has completed a preliminary technical and an economic feasibility study for a 3,500 MW project with two separate 500 kV transmission lines. A preliminary feasibility study final report was issued in June 2008.³²

High Plains Express is considering possible inclusion of SunZia, the New Mexico Wind Collector System and the Wyoming-Colorado Intertie projects as components of its project. The next stage for the High Plains Express Initiative is to perform a more advanced feasibility evaluation that includes geographic study areas, sequential development, operational modeling, public regulatory policies, further quantification of costs and benefits, cost recovery mechanisms, business structures, and continued stakeholder involvement. High Plains Express currently has eight participant utilities and three state organizations, identified in Table 8.

Table 8 - High Plains Express Participants

Xcel Energy	Colorado Springs Utilities
Public Service Company of New Mexico	Colorado CEDA
Tri-State Generation and Transmission	Wyoming Infrastructure Authority
Western Area Power Authority	New Mexico EMNRD ³³
Platte River Power Authority	Trans-Elect Development Company
Salt River Project	

2.4.10 TransWest Express Transmission Project

The TransWest Express Transmission Project is currently conceptualized as a 500 kV bi-polar transmission line from Wyoming to the Desert Southwest region originally proposed in 2005. The proposed 500 kV DC line would be approximately 850 miles in length and have a rating of approximately 3,000 MW, with a targeted in-service date ranged between 2013 and 2015. The project has focused on

³²http://www.rmao.com/wtpp/HPX/HighPlainsExpress%20First%20Stage%20Feasibility%20Report%2006_08.pdf

³³ New Mexico EMNRD is New Mexico's Energy, Mineral, and Natural Resources Department

regional needs and contemplated transmission service between Wyoming and Nevada, California and Arizona. TransWest Express was being developed by APS, the Wyoming Infrastructure Authority ("WIA") and National Grid. A recent acquisition of the rights to the TransWest Express Transmission Project by Anschutz Corporation has resulted in National Grid choosing to withdraw from the TransWest Express project and APS to remain involved in a more limited fashion. While no ten year plan has been filed with the Commission, the project was incorporated in the 2007 WestConnect Transmission Plan. Therefore, this project was not considered for the adequacy analysis nor included in the ten year plan statistics compiled for this BTA. An overview map showing the general routing of the line is included as Exhibit 17.

The TransWest Express sponsoring entities and PacifiCorp have previously agreed to co-develop TransWest Express and the Gateway to South 500 kV Projects. In accordance with the WECC Regional Planning Review Process, the Northern Tier Transmission Group ("NTTG") and SWAT subregional planning processes, and FERC Order 890, the four co-developers held four stakeholder meetings to obtain feedback on the TransWest Express and Gateway South projects. Significant progress was also made in the following areas over the past year:

- Right of way applications were filed with Bureau of Land Management ("BLM"),
- A conceptual design report was completed,
- A WECC Regional Planning Project Review was completed and a WECC Phase 1 Rating Process was initiated,
- TransWest Express was reconfigured based on Stakeholder input and resource market changes, and
- National Grid recently completed and published a study³⁴ that concluded that Wyoming-produced wind power provides significant potential for providing the West with a reliable source of renewable energy.

³⁴ *The West's Renewable Energy Future: A Contribution by National Grid* (July 2008), Section 4.2 at pages 19-24 Available at http://www.nationalgridus.com/non_html/transmission-WestRenewableFuture.pdf

2.5 Significant Transmission Upgrades

Exhibit 8 provides a map and a table of the 2008 WECC rated transmission paths in Arizona. Ratings of these transmission paths are increased in two ways: either a new line is constructed and integrated into an existing path or existing lines in a path are upgraded to achieve an increased path rating. Several EHV transmission line upgrades are planned for implementation during the ten year period considered by this BTA. Such upgrades are considered significant because they are integral to transmission paths that must go through a WECC path rating process to establish the capacity increase attributable to the proposed upgrades. The following transmission path upgrades enable improved interstate market transactions over the Arizona EHV transmission system without the construction of new lines.

The rating of the East of River ("EOR") Path or Path 49 has undergone numerous rating increases since its inception. That tradition continues over the next few years. The short term upgrades of the Palo Verde to North Gila 500 kV line and the existing Palo Verde to Devers 500 kV line in 2006 resulted in a 505 MW increase in the path rating to 8055 MW. The EOR 9300 project upgrades to the Navajo to Crystal 500 kV line and the Perkins to Mead 500 kV line in 2008 and 2009 will increase the path by an additional 1245 MW to 9300 MW. This path rating will also increase with the addition of the proposed second Palo Verde to Devers 500 kV line and the second 500 kV line to North Gila from the Palo Verde hub.

The Coronado to Silver King 500 kV line will be upgraded in association with Springerville Unit 3 and Springerville Unit 4. As a result of completion of these upgrades in 2009 the Coronado Transmission System and Path 54 will increase by 400 MW.

The existing Navajo Transmission Southern System (Path 51) consists of two 500 kV transmission lines: the Navajo to WestWing line and the Moenkopi to Yavapai line. In 2010 the Navajo Southern Transmission System will be upgraded. The Path rating will increase by 800 MW from north to south.

3. COMMISSION ORDERED STUDY WORK

3.1 History and Purpose

Over the course of prior BTAs the Commission has ordered that supplemental study work be performed by Arizona utilities to facilitate subsequent assessments. The ordered study work has a twofold purpose. The ordered studies are intended to improve the accuracy and prudence of the conclusions and recommendations resulting from the BTA. Secondly, the ordered studies are intended to better inform the Commission regarding the merits of focusing industry attention on areas of the transmission system that potentially need improvement.

Study work ordered by the Commission falls into four categories. The transmission load serving capability of local load pockets has been a study requirement since the First BTA. Reliability must run studies have been required for potentially constrained transmission import areas with local generation since the Second BTA. N-1-1 and extreme contingency studies have been required to ascertain the transmission system's robustness to withstand extra ordinary emergency events since the Third BTA. The Fourth BTA Decision added a requirement for an assessment of the transmission capacity available and needed to accommodate Arizona renewable energy development in the 5th BTA.

3.2 2008 Local Area Transmission Load Serving Capability Assessment

In the First BTA, Staff identified five load pockets in Arizona that should be monitored for transmission import constraints: Phoenix, Tucson, Yuma, Mohave County and Santa Cruz County. The Second BTA added a sixth area located in Southeastern Arizona (Cochise County). The Cochise County area requirement was added to the Commission's areas of concern due to a major blackout of the area in 2001. The Third BTA added Pinal County as a local area that needed to be monitored. Inclusion of Pinal County was prompted by the necessity of transmission providers to implement a remedial action scheme ("RAS") or special protection scheme ("SPS") for single contingencies with operation of the new Desert Basin and Sundance power plants and additional gas turbines at Saguaro Power Plant.

The transmission import capability for these seven local areas remains a consideration for this BTA. Utility Distribution Companies have the obligation to assure that adequate import capability is available to meet the load requirements of all distribution customers within their service areas.³⁵ The Commission

³⁵ Arizona Administrative Code R14-2—1609.B

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has adopted the use of two terms as indicators of the load serving capability of local load pockets: Simultaneous Import Limit ("SIL") and Maximum Load Serving Capability ("MLSC").³⁶ APS, SRP, TEP and SWAT have filed studies with the Commission that address the SIL and MLSC of six of Arizona's seven load pockets. A summary of the SIL and MLSC for each local area is depicted in Table 9.

Table 9 - Local Area Transmission Load Serving Capability

Mohave County*	2016	1,150	Davis-McCulloch 230 kV	Riveria 230 kV Post Trans Voltage
		1,250	Parker- Black Mesa 230 kV	Black Mesa 230 kV Post Trans Volt
APS/SRP/WAPA Phoenix	2011	11,245	Palo Verde-Rudd 500 kV	Voltage deviation > 5%
		15,436	Palo Verde-Rudd 500 kV	Voltage deviation > 5%
	2016	13,136	Palo Verde-Rudd 500 kV	Rudd-Libert 230 kV Overload
		17,747	Orme-Rudd 230 kV Ckt 1	Orme-Rudd 230 kV Ckt 2 OL
Pinal County CATS HV	2016**	1,309	ED-5A-Empire 115 kV	TestTrack-CasaGrande 230 kV OL
		1,709	TestTrack-Casa Grande 230 KV	Voltage deviation > 5%
Santa Cruz County	2008	60	N-0 / Nogales Tap-Kantor 115 kV	Voltage / ***
		115	N-0 / Nogales Tap-Kantor 115 kV	Voltage / ***
	2011	60	N-0 / Nogales Tap-Kantor 115 kV	Voltage / ***
		110	N-0 / Nogales Tap-Kantor 115 kV	Voltage / ***
	2016	120	N-0 / Vail-Kantor 138 kV	Vail-Kantor 138 kV/ ***
		180	N-0 / Vail-Kantor 138 kV	Vail 345/138 kV Trans/ ***
TEP Tucson	2008	1,950	Sag.-Tortolita 500 KV #1 & 2	Voltage Stability
		2,425	Pinal West-South 345 kV	AV-Marana 138 kV Overload
	2011	2,250	Winchester- Vail 345 KV	Bicknel 345/230 Trans Overload
		2,875	Springerville- Vail 345 kV	N. Loop-W. Ina 138 kV Overload
	2016	2,650	Springerville-Vail 345 kV	N. Loop-DMP 138 kV Overload
		3,125	Springerville-Vail 345 kV	N. Loop-W. Ina 138 kV Overload
APS Yuma	2011	258	Hassayampa-N. Gila 500 kV	Pilot Knob-Yucca 161 KV OL
		610	Hassayampa-N. Gila 500 kV	Pilot Knob-Yucca 161 KV OL
	2016	414	N. Gila-Imperial Valley 500 kV	Gila 230/161 kV Transformer OL****
		716	N. Gila-Imperial Valley 500 kV	Gila 230/161 kV Transformer OL****

Data per 2 APS & 3 TEP RMR Studies and CATS HV Study

SIL = Simultaneous Import Limit

MLSC = Maximum Load Serving Capacity

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Notes:

* MSLC increase to 1,500 MW w/ Parker to N. Havasu 230 kV looped into Black Mesa

** Both entries are for SIL: 1st row is w/o WAPA upgrades to 230 kv / 2nd is w/ WAPA upgrades

*** Loss of Load occurs and Restoration Plans must be activated

**** WAPA proposes to use RAS or SPS to open transformer for N-1

³⁶ Appendix C, RMR Conditions and Study Methodology

3.2.1 Cochise County Import Assessment

The Cochise County load serving entities are APS, TEP, and Sulphur Springs Valley Electric Cooperative ("SSVEC"). The Cochise County load, from Ft. Huachuca to Douglas, is served via four radial transmission lines. The loss of any one of these lines during summer peak could result in the inability of one or more of the load serving entities in this area to serve their entire load. A study of the Cochise County Area was performed following a 2001 blackout of southern Arizona and was documented in the Second BTA. At that time no Commission action was deemed necessary because local transmission and distribution switching capability was sufficient to minimize the outage time for customers for single contingency outages and service could be restored to all customers for loss of a single transmission line.

The Fourth BTA documented that N-1 contingency violations occurred for loss of the Apache to Butterfield, Butterfield to San Rafael 230 kV line, or the Pantano to Kartchner 115 kV line in Southwest Transmission Cooperative's ("SWTC") 2015 planning study. The Commission granted SWTC a time extension until January 2008 to resolve these three Cochise County N-1 contingency violations and to file expansion plans that resolve those issues as part of its 2008-2017 ten year plan. A subcommittee of the Southern Arizona Transmission Subcommittee ("SATS") subregional planning group has undertaken this task. An extended customer service outage following a series of outages during the period October 9th through October 11th in 2007 caused a refocus of the technical studies to be performed for the Cochise County Area. Another key outage event occurred in this geographical area on August 29, 2008. The SATS Cochise County Study Report - Fourth Draft is publicly available on the WestConnect website.³⁷

SWTC filed study results in support of its ten year plan that indicates that its latest transmission plan is void of single contingency overloads through 2017. This is substantiated by the CATS EHV Study Report results. This is achieved by looping an existing WAPA Nogales Tap to Adams 115 kV line into Pantano. SWTC also reported in its ten year plan that a new radial 230 kV line from Sloan to Kartchner with a to-be-determined ("TBD") in-service date was the most "economical, feasible and robust plan" for a third 230 kV injection to the Sierra Vista area. SWTC reports that the addition of this new line "would sustain the SSVEC loads in Sierra Vista past the 2026 projected load levels." Diverse opinions were expressed at the May 22nd and 23rd BTA Workshop regarding choices of solutions emerging from the

³⁷ <http://westconnect.com/filestorage/4th%20Draft%20Cochise%20County%20Study%20Report%20-%20Clean.doc>

Cochise County study process. On July 8, 2008, SSVEC filed a document commenting on the Cochise County study work and pending solutions filed in SWTC's ten year plan.

The Cochise County Study Report indicates that TEP cannot restore service to 6 MW of its existing 22 MW Fort Huachuca load following an outage of the Vail to Fort Huachuca 138 kV line. Therefore, the Fort is considering an emergency tie with SSVEC. The report also indicates that APS does not anticipate any significant load growth in the ten year time period. Following an outage of the Adams to Mural 115 kV line APS can restore service by starting its Douglas generator and closing an emergency tie with SSVEC at McNeal Substation assuming there is sufficient line capacity available. APS contends there is sufficient transmission capacity in the area and that all it anticipates needing is a second emergency 69 kV tie with SSVEC south of Sierra Vista. APS does acknowledge in the report that additional transmission capacity would be required if significant spot load growth occurs in the APS service area. In contrast, SSVEC has advocated looped transmission service as a solution to its local service reliability concerns.

It is Staff's opinion that the proposed Sloan to Huachuca radial 230 kV line is not an adequate transmission solution for Cochise County. It perpetuates radial transmission service until at least 2026. A "restoration of service"³⁸ approach to transmission outages has historically been the operational mantra for Cochise County. This has been of concern to Staff since the first BTA ten years ago. The critical nature of Fort Huachuca's mission and the accompanying load growth occurring in southern Cochise County (predominantly in Sierra Vista) begs for a transition to "continuity of service"³⁹ for transmission outages. Furthermore, the proposed line does nothing to mitigate the APS and TEP dependence upon SSVEC for emergency restoration of service.

APS, SSVEC and TEP each have an obligation to assure that adequate transmission import capability is available to meet the load requirements of all distribution customers within their service areas.⁴⁰ Perpetuating "restoration of service" following a transmission line outage to the area for another 20 years is not in the public's interest. It would be appropriate for SATS to perform studies that develop transmission plans that assure a transition to "continuity of service" for single contingency transmission lines in Cochise County within the next five to ten years.

³⁸ Defined in Appendix F of the Fifth BTA

³⁹ Pursuant to Arizona Administrative Code R14-2-208(D) (1), "Each utility shall make reasonable efforts to reestablish service within the shortest possible time when service interruptions occur."

⁴⁰ Arizona Administrative Code R14-2—1609.B

3.2.2 Santa Cruz County Import Assessment

Santa Cruz County, similar to Cochise County, is served by a radial transmission line. UNSE is the load serving entity in Santa Cruz County. The customer service and system impacts and risks associated with the loss of a single 115 kV line serving Santa Cruz County are well chronicled in prior BTA assessments and siting proceedings of the Gateway 345 kV transmission project.⁴¹ A TEP 345 kV Gateway Transmission Project was proposed as a solution and a Certificate of Environmental Compatibility was approved by the Commission. A NEPA environmental impact study has been concluded for the project but Federal Records of Decision and a Presidential Permit for the new 345 kV Gateway Transmission Project are still pending with federal agencies.

UNSE installed a 20 MW generator in Nogales in 2004 and plans to upgrade its existing 115 kV line to 138 kV in 2013 as interim solutions to ensure the ability to restore service after an outage. This latter action is what increases the Table 9 reported SIL and MLSC for Santa Cruz County in 2016. However, Santa Cruz County remains exposed to service outages for all of its UNSE customers following the loss of the single transmission line serving the county. Some customers will experience extended periods of service interruption for that transmission line outage. The most recent reported outage occurred on July 16, 2008 and resulted in 63,455 customer hours of service interruption.⁴² UNSE indicates that service cannot be restored for this outage at summer peak as depicted in the following Table 10.⁴³

Table 10 – Non-served Load for Transmission Line Outage⁴⁴

YEAR	2008	2011	2016
FORECAST LOAD	77 MW	85 MW	99 MW
LOAD REJECTION	~9 MW	~16 MW	~36 MW

⁴¹ ACC Docket No. L-00000-01-0111

⁴² Records of Arizona Corporation Commission, Outages Forms, Reported by Rick Molina with UNS Electric on July 17, 2008

⁴³ TEP and UNS Electric response to First Draft of 2008 BTA, August 6, 2008

⁴⁴ Table 10 is based on continued radial operation and a worst case outage of the transmission segment north of Kantor.

The UNSE ten year plan includes the Gateway 345/115 or 345/138 kV transformer and associated 115 kV or 138 kV line from Gateway to Valencia and reports these elements as pending federal permitting. The UNSE ten year plan also includes a third line to serve Santa Cruz County and describes it as under review. That line is a Gateway to Sonoita 138 kV line. Either of the new lines would resolve the exposure to customer service interruptions for outage of the existing 115 kV line.

3.2.3 Mohave County Import Assessment

UNSE and Mohave Electric Cooperative ("MEC") are the load serving entities in Mohave County. The Mohave County RMR study indicated a SIL of 1,150 MW would exist for the area in 2016. Since the 2016 Mohave County load is 1,107 MW, the study concludes the peak load can be served without relying on the operation of local fossil generation. UNSE, therefore, concludes that no RMR condition would exist for the area. The Mohave County area RMR study also indicated that the MLSC was 1,250 MW and could be increased to 1,500 MW with the existing Parker to North Havasu 230 kV line looped into Black Mesa Substation. UNSE reported that it has requested WAPA to analyze this transmission improvement to resolve post transient voltage problems in the area.

The transmission system in Mohave County is primarily owned and/or operated by WAPA. Therefore, all modeling and study work associated with the 2008 Mohave County RMR was performed with input from WAPA. This included refining modeling methodologies to determine study metrics such as SIL and MLSC. The Mohave County study modeled 337 MW of local hydro generation when determining the SIL limit. This is not consistent with the Commission's definition of SIL which establishes the maximum load that can be served in a local area without local generation.⁴⁵ The MLSC as defined by the Commission is intended to indicate the maximum area load that can be served with local generation at maximum output less any local reserve requirement.⁴⁶ The Mohave County study does include 80 MW of new Black Mountain combustion turbines but fails to model or acknowledge other new generation developments occurring in the area.

This concern is reinforced by the fact that the Commission actually approved a CEC for the Northern Arizona Energy Project ("NAEP") on December 21, 2007.⁴⁷ NAEP is a new 175 MW generation project

⁴⁵ Appendix C: RMR Conditions and Study Methodology

⁴⁶ Ibid

⁴⁷ ACC Decision No. 70108, Docket No. L-00000FF-07-0134-00133

interconnecting at Griffith Substation. The NAEP siting process revealed that under maximum generation conditions at Griffith a RAS or SPS is required to trip NAEP units for a single contingency outage for either of two WAPA transmission lines when the NAEP generation is above 70 MW. The NAEP generation was not modeled in the Mohave County RMR study. Conversely, the new Black Mountain combined cycle units (80 MW) were not modeled in the NAEP Study.

3.2.4 Pinal County Import Assessment

The load serving entities providing electric service in Pinal County are APS, Electrical District Nos. 2, 3, 4, and 5, and the San Carlos Irrigation District ("SCIP"). These entities participate in the CATS HV Studies for the area. The 2016 CATS HV Study indicates that Pinal County is capable of serving 200 to 600 MW of load growth beyond that forecast for 2016. The quantity of load growth that can be accommodated beyond 2016 depends upon whether WAPA's local 115 kV lines are upgraded to 230 kV. Both entries in the Table 9 SIL/MLSC column are reported as SIL limits for the area. The first Pinal County SIL entry is applicable without the WAPA line upgrades and the second is applicable when the lines are upgraded to 230 kV but operated at 115kV. However, these are considered to be "pseudo" SIL limits because the Desert Basin, Sundance, and Saguaro generation in Pinal County were modeled and scheduled for normal summer peak conditions. SIL is intended to establish the maximum load that can be served in a local area without local generation.

3.2.5 Import Assessments Requiring RMR Studies

The 2011 and 2016 peak load forecasts for the Phoenix, Santa Cruz County, Tucson, and Yuma areas exceed each respective area's SIL capability. This condition is the subject of the required RMR studies discussed in detail in the next section of this report. The SIL and MLSC limit for each of these areas increases between 2008 and 2016. These improvements are achieved by the construction of planned transmission improvements contained in this BTA. The planned system improvements that enable the increased SIL and MLSC improvements are well documented in the respective RMR study reports.

Five of Arizona's seven load pockets contain local generation with potential RMR conditions. An RMR condition exists when the local load served by a utility distribution company ("UDC"), or group of UDCs, exceeds the SIL of the local transmission system. The Commission has approved and adopted a

definition of RMR Conditions and Study Methodology to be utilized for RMR study requirements.⁴⁸ It requires that the Commission receive information from RMR studies that identifies four essential RMR indicators:

- RMR hours - The number of hours during which the local load is above the SIL,
- RMR energy - The amount of energy served from RMR generation,
- RMR peak demand - The maximum RMR amount of capacity that the RMR generators would be required to produce, and
- RMR costs - The costs of out-of-merit-order⁴⁹ dispatch from RMR generation.

This is the third BTA with a Commission ordered specific RMR filing requirement. UNSE was ordered to file an updated RMR Study for both Mohave County and Santa Cruz County by January 2008. RMR studies have been performed and provided to the Commission for the Phoenix Area and APS Yuma Area,⁵⁰ Mohave County,⁵¹ Tucson,⁵² and Santa Cruz County.⁵³ A summary of the RMR study results reported and filed by APS and TEP are depicted in Table 11.

⁴⁸ Appendix C, RMR Conditions and Study Methodology

⁴⁹ Out-of-merit order generation is more expensive than generation in the economic dispatch order

⁵⁰ APS Must Run Analysis 2008-2017, APS 2008-2017 Ten year Plan, filed January 31, 2008

⁵¹ UNSE Mohave County SIL, MLSC, RMR Study, filed July 8, 2008

⁵² TEP SIL, MLSC, RMR, Common Corridor & Extreme Contingency Study, filed July 8, 2008

⁵³ UNSE Santa Cruz County RMR Study 2008-2016, filed July 8, 2008

Table 11 - RMR Study Results

AREA	Year	Peak Load (MW)	SIL (MW)	MLSC (MW)	RMR			
					RMR Gen @ Peak (MW)	Hrs	Energy (MWh)	Cost (\$000)
Mohave County	2016	1,007	1,150	1,250	-	-	-	\$ -
APS/SRP/WAPA Phoenix	2011	13,433	11,245	15,436	1,920	317	168,000	\$ -
	2016	15,542	13,136	17,747	1,919	285	155,000	\$ -
Santa Cruz County	2008	77	60	115	2	-	-	\$ 3
	2011	85	60	110	17	-	-	\$ 76
	2016	99	120	180	-	-	-	\$ -
TEP Tucson	2011	2,629	2,250	2,875	320	225	-	\$ 426
	2016	3,010	2,650	3,125	315	145	-	\$ 276
APS Yuma	2011	475	258	610	194	2,258	146,000	\$ 1,000
	2016	553	415	716	144	144	30,000	\$ -

SIL = Simultaneous Import Limit

MLSC = Maximum Load Serving Capacity

RMR = Reliability Must Run

Data per two APS & 3 TEP RMR Studies

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3.2.6 Mohave County RMR Assessment

Mohave County is the only Arizona load pocket with local generation that has a peak load that does not exceed its reported SIL rating. For this reason no RMR studies were actually performed by UNSE for Mohave County. UNSE reported that RMR conditions do not exist for the Mohave County area because it can reliably support its projected peak load without dispatching any local fossil generators. However the SIL limit for Mohave County is in question due to the presence of 337 MW of local hydro generation as described in Section 3.2.3 of this report. A Mohave County RMR condition may actually exist and require further study to determine if the actual SIL is lower than reported in the Mohave County RMR study report.

3.2.7 Phoenix Metropolitan Area RMR Assessment

The interconnected transmission system serving the metropolitan Phoenix area is owned and operated by APS, SRP and WAPA. A majority of the Phoenix area load is served by transmission imports. Load growth occurring in the North and West segment of the Phoenix area is served by APS and the load growth in the East and South Valley is served by SRP. An RMR condition exists for the Phoenix area

because the peak load for the area exceeds the SIL of the existing and planned transmission system serving the area.

The Phoenix area 2008 RMR study concludes that for the Phoenix metropolitan area, the cost of RMR energy is not significant and advancement of transmission projects to increase import capability is presently not cost justified. The following other key RMR study findings were reported for the Phoenix metropolitan area:

1. The projected local generation reserve margin exceeds the required reserve margin (865 MW) for those hours during which RMR conditions exist. The projected reserve margin is 1,758 MW in 2011 and 1,759 MW in 2016.
2. Local generation is not expected to be dispatched out of economic dispatch order in 2011 and 2016.
3. There are no emission impacts due to RMR generation energy production in 2011 and 2016 because the local units are not dispatched out of economic dispatch order.
4. Phoenix area RMR conditions pose no impact to local generation capacity factor and total yearly natural gas consumption by the Phoenix area generators because the local units are already scheduled in economic dispatch order irrespective of the SIL being exceeded.

The Phoenix area RMR study is thorough and well documented. The study comports to the Commission's RMR study methodology and actually performs production cost simulations using industry accepted study tools and publicly available data. No flaws in assumptions or modeling are evident in the report. The study results reflect a system perspective of transmission import and RMR analysis for the Phoenix metropolitan area for all the local generation and three local transmission providers: APS, SRP and WAPA.

3.2.8 Tucson Area RMR Assessment

The Tucson area is interconnected to the EHV transmission system via three 345 kV substations: Tortolita, South and Vail. These three stations interconnect and supply energy to the local TEP 138 kV system. An RMR condition exists for the Tucson area because the local TEP load exceeds the SIL of the existing and planned local TEP transmission system.

TEP's RMR study for the Tucson area reports that the static var compensator ("SVC") added at Northeast Loop 138 kV Substation in 2008 eliminates the voltage constraint reported in its 2006 RMR study for loss of the Winchester to Vail 345 kV line. The 2008 report indicates the 1,950 MW 2008 SIL is still limited by voltage instability for loss of both Saguaro to Tortolita 500 kV lines. The study also reports that TEP's EHV scheduling capability to Tucson is also 1,949 MW via the Pinal West to South 345 kV line, Saguaro to Tortolita 500 kV lines and the Springerville to Vail 345 kV lines. Therefore, one can conclude that TEP's 2008 SIL is set by both EHV limitations. With a 2008 load forecast of 2,417 MW the TEP SIL limit is exceeded and an RMR condition continues to exist.

The reported Tucson area peak load forecast for 2011 and 2016 do exceed the reported SIL for the respective years. Therefore, an RMR condition would actually exist. The RMR report indicates for 2011 the SIL limit is a thermal limit of the Bicknell 345/230 kV transformer for the corridor outage of the Springerville to Vail and Winchester to Vail 345 kV lines. TEP reports that the thermal overload does not pose a problem because the transformer will be automatically tripped when its loading reaches the trip point of 240 MW. By running local RMR generation the same critical outage becomes voltage stability limited. By 2016 the RMR study indicates the critical outage has become a single contingency loss of the Springerville to Vail 345 kV line. The SIL limitation becomes a thermal overload of the North Loop to West Ina 138 kV line in 2016. TEP reports that the cost to mitigate and eliminate the RMR costs with transmission improvements ranges from \$86 to \$553 Million.

TEP filed an amended Tucson area RMR Study report on August 6, 2008, that contains the information necessary for Staff to complete its assessment of this RMR study. The amended report explains how the Tucson area RMR peak demand was established and how the RMR cost was determined. The system changes between the RMR 2011 and 2016 studies were also identified. Staff has reviewed the amended report and finds the RMR study to be complete and a thorough representation of RMR conditions that exist in the Tucson area.

3.2.9 Santa Cruz County RMR Assessment

The Santa Cruz County RMR study considers a local area served by a radial line. Therefore, the RMR peak demand is simply the amount of local generation that must be run to avoid an overload of that line at peak load conditions. The report indicates that in 2008 the RMR for the N-0 condition requires UNSE to run 2 MW of combustion turbines ("CT") at Valencia to serve 77 MW. In 2011 the UNSE will be required to run 17 MW at Valencia to serve 85 MW. After upgrade of the 115 kV line to 138 kV has

occurred in 2013 there is no RMR generation required for the N-0 condition because the 120 MW SIL exceeds the 99 MW 2016 forecast load.

Service will be interrupted to all customers resulting in emergency load restoration for the loss of the single transmission line. Emergency load restoration makes use of the combustion turbines ("CT") at the Valencia station and closing in the Canoa-Kantor 46 kV tie. Per TEP's "2008 Green Valley and Kantor Substation Summer Preparedness" report dated April, 2008, up to 12.5 MW of load at Kantor can be picked up by closing the Canoa-Kantor 46 kV tie. Approximately 60 MW of load downstream of the Kantor substation can be picked up by the CTs at Valencia. Analysis indicates that some form of load rejection will also be required as the combination of the 46 kV emergency tie and CT operation is inadequate to pick up the forecast load during on-peak conditions. In 2008, service cannot be restored to 9 MW of load for this outage. The amount of load that cannot be restored to service, for the outage, grows to 36 MW by 2016.⁵⁴

3.2.10 Yuma RMR Conditions and Import Assessment

The Yuma area is served by an internal APS 69-kV sub transmission network containing the entire APS load in the transmission import limited area. There are external ties to WAPA at Gila Substation and the Imperial Irrigation District ("IID") at Yucca Substation. There is also a 500 kV bulk power interface at North Gila with 500kV lines running east to the Palo Verde Hub and west to Imperial Valley in California. APS reports that it coordinated the modeling for the RMR study with the WAPA Phoenix office. The APS Yuma RMR study assumes that 96 MW of new generation will be in-service and connected at the Yucca substation in 2008.

The APS Yuma area 2008 RMR study concludes that RMR conditions do exist for the Yuma area and that there is some limited amount of RMR costs in 2011. The planned APS transmission improvements in the area are sufficient to mitigate RMR cost that would otherwise be associated with 2016 RMR conditions. APS reported that advancement of planned transmission projects to increase import capability in earlier years is not warranted. The following other key RMR study findings were reported for the APS Yuma area:

⁵⁴ TEP and UNS Electric response to First Draft of 2008 BTA, August 6, 2008

1. The projected local generation reserve margin exceeds the required reserve margin (97 MW) for those hours that RMR conditions exist. The projected reserve margin is 119 MW in 2011 and 169 in 2016.
2. The Yuma area load is expected to exceed the available transmission import capability for 2,258 hours in 2011 and 719 hours in 2016. These hours represent approximately 7% of the annual energy requirements for Yuma in 2011 and approximately 1% in 2016.
3. The import constraint could cause APS Yuma generation to be dispatched out of economic dispatch order for 265 hours in 2011 and 25 hours in 2016.
4. The estimated annual economic cost of Yuma area generation required to run out of economic dispatch order is approximately \$1 million for 2011. RMR costs are negligible by 2016 with the planned addition of the second Palo Verde to North Gila 500 kV line and the North Gila to TS8 230 kV line.
5. Removing the transmission constraint would reduce total Yuma area air emissions by a minimal amount for years 2011 and 2016.
6. Removing the transmission constraint could reduce total yearly natural gas consumption by the Yuma area generators by 0.294 BCF and 0.019 BCF for 2011 and 2016, respectively.

The APS Yuma area RMR study is thorough and well documented. The study comports to the Commission's RMR study methodology and actually performs production cost simulations using industry accepted study tools and publicly available data. Assumptions and modeling evident in the report are accurate and appropriate for the APS system. However, major system changes are being proposed for the area by other interconnected entities such as WAPA, WMIID, IID and parties seeking Large Generator Interconnection Agreements ("LGIA") in the area for generation projects exceeding 100 MW. It would be helpful to have a system perspective of the RMR conditions for the entire local area in the future rather than limiting the RMR analysis solely to the APS 69 kV system. This is particularly true given that the SIL and MLSC import limits to the APS system are restricted by the overloads on other transmission providers' systems. In fact the Yuma area RMR cut plane was adjusted in the 2016 study for this very purpose.

3.3 Ten Year Snapshot

The CATS EHV workgroup performed and filed a report documenting results of its Ten Year Snapshot Study. This study provides an assessment of the ten year plans proposed by Arizona transmission owners. The CATS EHV workgroup is partially comprised of the following transmission participants: APS, SRP, SWTC, TEP and WAPA. The Ten Year Snap Shot Study consists of conducting N-0 and N-1 power flow analyses that determine the adequacy of the Ten Year Plan. Special N-1-1 power flow analyses were also conducted to show the criticalness of individual participant projects in the ten year plan.

The Ten Year Snapshot Study verified that there were no actual overloaded elements in the 2016 base case. The CATS EHV Study Group reached a variety of conclusions regarding N-1 contingencies.

1. The power flow solution diverged for eight single contingencies. These problems were resolved either by operational solutions or correcting the modeling of the transmission system for those specific contingencies.
2. Fourteen N-1 contingencies produced twenty-seven overloaded transmission elements. Participants were encouraged to provide mitigating solutions to resolve these overloads.
 - a. Eight of the overloads were mitigated by modeling operational solutions and modeling existing tariff authorized interruptible load shedding schemes.
 - b. TEP resolved its three N-1 contingency overloads by incorporating additional transmission facilities that were not planned at the time the original base case was coordinated. These facilities include a Naranja to Rancho Vistoso 138 kV line and a Northeast to De Moss Petrie 138 kV line. These improvements create a third 138 kV transmission path from North Loop to De Moss Petrie.
 - c. Four N-1 contingencies overloaded sixteen WAPA transmission lines. Overloads involving these elements were not resolved.
3. The N-1 analysis showed 67 buses with greater than five percent voltage deviation. The analysis in this study could not determine if these deviations were realistic or as severe as reported. The underlying transmission system is not sufficiently modeled in the case to accurately determine the actual voltage deviation resulting from an N-1 contingency in 2016.

3.3.1 Special N-1-1 Studies

In its fourth BTA Decision No. 69389, the Commission ordered that utilities continue to comply with single contingency criteria overlapped with bulk power system facilities maintenance (N-1-1) for the first year of the BTA analysis period as required by WECC and NERC. Two forms of N-1-1 studies have been filed in response to this Commission requirement. The first is the TEP RMR Study and the second is a special N-1-1 study performed by the CATS EHV Subcommittee.

TEP's RMR Study incorporates results of common corridor outages and N-2 EHV outages for 2008. TEP reported that it routinely studies simultaneous outage of all combinations of two transmission elements, whether common mode or unrelated. The report states that the simultaneous outage of two elements is equivalent to having one element initially out of service and then losing the other element. TEP's RMR Study concludes that for 2008 system conditions:

- It can survive double contingencies involving parallel lines in the Springerville – Vail corridor.
- It can also survive loss of all EHV transformers at any one of its EHV substations: Tortolita, South, and Vail.

SRP filed the CATS EHV Study on behalf of the CATS EHV Subcommittee. The CATS EHV study contained special N-1-1 studies for 2016. The purpose of the CATS EHV special N-1-1 studies was to investigate the criticalness of individual transmission projects to the ten year plan. The impact of planned projects being delayed or cancelled was demonstrated by removing a planned project (230 kV and above) from the case and then performing an N-1 contingency analysis. This analysis is more strenuous than the WECC and NERC N-1-1 criteria. The thermal loading and voltage deviation results for these contingencies showed that all planned projects produced adverse impacts if omitted from the ten year plan. Contingencies emerged during the N-1-1 analysis that produced diverging solutions not found in the N-1 analysis. Removing the APS Raceway to Avery 230 kV project from the case is the only project that did not produce an additional or increased overload above what was found in the N-1 analysis. New or worsened voltage deviation results also occurred for these contingencies than were experienced in the CATS-EHV N-1 analysis. The overall results indicate the planned projects are required to resolve potential problems in the ten year plan.

3.3.2 Extreme Contingency Study Work

The Commission directed that, as part of the 5th BTA, parties continue to address and document extreme contingency outage studies for Arizona's major generation hubs and major transmission stations, and identify associated risks and consequences, if mitigating infrastructure improvements are not planned. The Commission also ordered that certain N-2 contingency studies and extreme contingencies in TEP's 2016 case need to be resolved. Studies have been filed in response to these two Commission requirements. Two extreme contingency studies were performed; one by APS for the CATS EHV Subcommittee and the other by TEP as part of its RMR Study for the Tucson area. Exhibit 7 graphically displays the extreme contingency corridors studied in 2008 by both the APS and TEP studies.

EHV Transmission line corridors were chosen for study based upon exposure to forest fires and other extreme events. APS performed studies for corridor outages involving the following four sets of lines:

- Cholla-Saguaro and Coronado-Silver King 500kV lines
- Navajo Westwing 500kV lines
- Four Corners-Cholla-Pinnacle Peak 345kV lines
- Glen Canyon-Flagstaff-Pinnacle Peak 345kV lines

TEP performed the corridor outages involving the Springerville to Vail and Springerville to Winchester to Vail 345 kV line.

The extreme contingency studies included the loss of all EHV transformer banks at each of the following substations: Browning, Tortolita, South and Vail Substations. These are all major EHV delivery points to the Phoenix and Tucson metropolitan load centers and thus warranted study. Studying other major delivery stations transformer outages would be duplicating effects of the transmission line corridor simulations or single contingency outages normally studied as part of the routine ten year planning process.

TEP studied its corridor outages and loss of major hubs for 2008. TEP's normal operating procedures include the ability to survive the studied corridor outages utilizing a Tie Open Load Shed scheme. Study results show that TEP can survive these extreme contingencies under the 2008 system condition.

The CATS EHV Subcommittee studied its assigned group of extreme contingencies for 2009 and 2016. In 2009, all customer loads can be served and local Phoenix reserve requirements met for all extreme outages studied. Some outages would require generation redispatch from other available sources. Some outages would require limited local system reconfiguration to alleviate overloads. Without system reconfiguration, outages of corridors into Pinnacle Peak would require local load reduction.

The 2016 outage of the Cholla-Saguaro and Coronado-Silver King 500 kV lines or the Glen Canyon to Flagstaff to Pinnacle Peak 345 kV lines causes a reduction of Phoenix import capability. In these cases a portion of the forecasted load could not be served. All local loads can be served and local Phoenix reserve requirements met for all other extreme outages studied. Some outages involving transmission connecting to remote generation would require redispatch from other sources. Some outages would require certain local system reconfiguration to alleviate local system overloads.

3.4 Arizona Renewable Energy Transmission Assessment

The Commission's Fourth BTA ordered that "in the next BTA, Commission regulated electric utilities, in consultation with the stakeholders, should prepare an assessment of ATC for renewable energy and prepare a plan, including a description of the location, amount and transmission needs of renewable resources in Arizona, to bring available renewable resources to load."⁵⁵

The 2007 SWAT Renewable Energy Transmission Task Force Report filed with Docket Control on May 15, 2008, under Docket No. E-00000D-07-0376 was submitted in compliance with the Order. The 2007 SWAT Renewable Energy Transmission Task Force Report responded to the two main points in the Order as follows:

1. "To address the Commission's first requirement that "Commission regulated electric utilities, in consultation with the stakeholders, should prepare an assessment of ATC for renewable energy" the parties to this report respond as follows:
 - a. Available Transfer Capacity ("ATC") data has been gathered for each utility in Arizona and displayed on the map shown in Exhibit 35. This information was developed during

⁵⁵ Decision No. 69389, March 22, 2007, page 8

stakeholder workshops held on October 8, 2007 and November 16, 2007 and includes APS, SRP, SWTC, and TEP and stakeholder input.

- b. ATC is a dynamic number that can change from day to day. For the purposes of this report, the ATC values observed in June 2007 are used to illustrate the status of the ATC in the Arizona transmission system as shown on Exhibit 35.
2. To address the Commission's second requirement that regulated utilities should "prepare a plan, including a description of the location, amount and transmission needs of renewable resources in Arizona, to bring available renewable resources to load" the parties to this report respond as follows:
 - a. In preparing this report, the parties have attempted to identify the location and amount of potential renewable resource opportunities that now exist in Arizona, and to present an overview of the transmission needs associated with such resource opportunities. The specific timing and development of transmission projects from renewable resource generation in Arizona depends on when specific generation projects are developed and seek interconnection with the transmission system.
 - b. As shown on Exhibit 36, the parties prepared a renewable resource map displaying areas where renewable resource development could potentially occur, based on input from three specific areas:
 - i. The Arizona Renewable Energy Assessment recently prepared for APS, SRP, SWTC and TEP by Black and Veatch (2007);
 - ii. The queue for renewable resource generation in Arizona requesting potential interconnection (as of October 15, 2007)
 - iii. Stakeholder/developer input on prospective development opportunities.

The renewable resource map was developed during workshop meetings on October 8 and November 16, 2007. It includes the location and a theorized potential total amount of renewable energy development opportunities for several different locations in Arizona. These opportunities include wind, solar, biomass, hydro and/or geothermal renewable energy types.

The map shown in Exhibit 36 provides an overview of the potential, but yet undeveloped renewable resource opportunities within Arizona. It identifies the major wind and solar renewable resources as clusters overlaid on current utility 10-Year Plans and WECC Phase 2 projects. Since geothermal and biomass/biogas opportunities are small relative to solar and wind opportunities, they are included within the total MW potential shown as wind and solar clusters.

During the October 8 and November 16, 2007 meetings, the utilities and stakeholders discussed the potential transmission alternatives for bringing the renewable energy resources to load, assuming that each of the resources was fully developed. The map shown in Exhibit 37 offers a potential transmission map that shows the lines that might be used to transport energy from these potential renewable resources to the major load pockets in Arizona. This map was developed by the utilities and stakeholders during both meetings and includes:

1. Existing transmission lines
2. Data contained within the APS, SRP, SWTC and TEP 10-Year Plans and WECC Phase 2 projects
3. Potential transmission lines discussed in the workshop meetings that would be necessary if all of the resources were to be developed

The efforts, conclusions and study elements should be interpreted and evaluated in the context of the ongoing regional and neighboring states' efforts addressing similar issues. Those efforts are described in the next section.

4. NATIONAL AND REGIONAL TRANSMISSION ISSUES

This section describes selected regulatory and industry activities since the Fourth BTA. Only those activities related to transmission infrastructure, transmission grid expansion at regional and subregional levels, transmission congestion, transmission reliability, and transmission rights and pricing are described. This section considers how such industry activities relate to the transmission expansion, siting and analysis in Arizona.

The US Congress adoption of the Energy Policy Act in 2005 ("EPAct 2005") resulted in several policy and regulatory changes at the national level that effects transmission planning. In 2007, the US Department of Energy ("DOE") and the Federal Energy Regulatory Commission ("FERC") adopted policies and approved regulations that:

1. Implement mandatory national reliability standards,
2. Establish nine planning principles for transmission providers,
3. Designate a National Interest Electric Transmission Corridor ("NIETC") for Southern California and Arizona, and
4. Yield a draft Programmatic Environmental Impact Study ("PEIS") for Federal Energy Corridors in eleven Western States.

Planning of electric transmission systems serves as a nexus for these four national efforts.⁵⁶

4.1 Western Renewable Energy Transmission Initiatives

Renewable portfolios and increasing public policy interest in renewable development have made the need for more transmission from the resource zones evident. Specific initiatives addressing integration of renewable energy sources into system exist on almost every transmission planning and governing level.

⁵⁶ 2007 WestConnect Planning Report, page 29

Public policy and interest in renewable resources have shifted for a variety of reasons, but are due in a large part to four main factors:⁵⁷

1. Climate change / greenhouse gas concerns
2. Regulatory requirements - renewable portfolio standards
3. Diversity and price volatility of fuel sources for growing load
4. Potential for federal or state regulation of conventional fuel sources - "Carbon Tax", "Carbon Cap and Trade" and related regulation

The resultant interest has led to an increased awareness of the need for additional transmission to meet the interest due to three primary factors:

1. Growing loads, transmission limitations
2. Renewable resources may be remotely located without access to available transmission
3. Financing of transmission can be expensive and difficult for smaller intermittent renewable generators.

4.1.1 NREL Western Wind and Solar Integration Study

The National Renewable Energy Laboratory ("NREL") is the nation's primary laboratory for renewable energy and energy efficiency research and development. NREL's mission and strategy are focused on advancing the U.S. Department of Energy's and our nation's energy goals. The laboratory's scientists and researchers support critical market objectives to accelerate research from scientific innovations to market-viable alternative energy solutions.⁵⁸

The objective of the Western Wind and Solar Integration Study ("WWSIS") is to support multi-state interests in understanding the operating and cost impacts due to the variability and uncertainty of wind and solar power on the grid. The study supports the Western Governor's Clean and Diversified Energy

⁵⁷ *Regional Renewable Energy Transmission Initiatives*, Laurie A. Woodall, May 23, 2008, BTA Workshop I, slide 3

⁵⁸ NREL Overview at: <http://www.nrel.gov/overview/>

Initiative (30 GW clean energy by 2015) and the President's Advanced Energy Initiative (wind can supply up to 20% of US electricity consumption). This study includes the WestConnect footprint and will also include the WestConnect Virtual Control Area Study.⁵⁹ The WWSIS project is to be completed in the second quarter of 2009. Recent WWSIS activities include:

1. Wind mesoscale modeling – completed development of time-series wind speed and power data for Western United States.
2. Solar mesoscale modeling and preliminary site selection - NREL has received solar direct normal and global insolation data at 10km resolution and at hourly intervals for 2004-6 from Richard Perez of State University of New York College ("SUNY"). The 3TIER Group has generated solar forecasts as part of their mesomodel. NREL has developed over 200 GW of power profiles for concentrating solar power ("CSP") plants based on parabolic trough technology with 6 hours of thermal storage. NREL has also modeled distributed photovoltaic ("PV") profiles for 150 sites.
3. Scenarios, Site Selection and Statistical Analysis – General Electric ("GE") will run production simulations on high renewable scenarios, select study sites based upon different integration scenarios and use statistical analysis of a 2008 baseline to develop additional study scenarios.⁶⁰

4.1.2 Western Governors Association Efforts

The Western Governors' Association ("WGA") is an independent, nonpartisan organization of Governors representing 18 Western states, and three U.S.-flag Pacific islands. The WGA is currently exploring clean and diversified energy options; encouraging pro-active transmission expansion; promoting coordinated permitting of needed interstate transmission expansion; developing a renewable energy tracking system; and urging the adoption of federal legislation to make reliability standards mandatory.

⁵⁹ NREL Western Wind and Solar Integration Study SWAT Meeting Oct 30-Nov 1, 2007

⁶⁰ NREL WWSIS Update July 1, 2008 at:
<http://www.westconnect.com/filestorage/UpdateWWSIS-6-28-08.doc>

Recent actions that took place in the West to advance the Governors' energy policies for the region are included in the Western Governors 2007 Annual Report.⁶¹

4.1.2.1 West-wide Renewable Energy Zones

The West-wide Renewable Energy Zone ("WREZ") kick off meeting occurred May 28, 2008, in Salt Lake City.⁶² The tasks the group plans to complete include:

1. Regional initiative to identify best renewable resources and designate Renewable Energy Zones based upon commercial potential and costs. An evaluation of commercial potential and costs will be performed by a consultant.
2. Inclusive stakeholder process to establish criteria to designate and validate zones for development
3. Develop conceptual transmission plans through WECC and subregional planning groups to deliver from highest ranking zones
4. Report to WGA regarding commercial obstacles facing renewable energy resources
5. Identify options for interstate cooperation of planning and permitting

4.1.2.2 Clean and Diversified Energy Initiative

The WGA launched the Clean and Diversified Energy Initiative with the adoption of a resolution that established three goals for the West:

1. Develop an additional 30,000 MW of clean energy by 2015 from both traditional and renewable sources;
2. Achieve a 20% increase in energy efficiency by 2020; and
3. Ensure a reliable and secure transmission grid for the next 25 years.

⁶¹ Western Governors' 2007 Annual Report at: <http://www.westgov.org/wga/publicat/annrpt07.pdf>

⁶² Briefing materials at: <http://www.westgov.org/wga/initiatives/wrez/briefing5-28.htm>

The Clean and Diversified Energy Advisory Committee ("CDEAC") was commissioned in 2004 by the Western Governors to identify technically and financially viable policy mechanisms, stressing non-mandatory, incentive-based approaches, to meet the need for clean, diversified energy. On June 11, 2006, the CDEAC released a report and recommendations for achieving and possibly exceeding the WGA's clean and diversified energy objectives.⁶³ The mission statement of the report was, "To ensure adequate transmission for the region to tap its vast clean and diversified energy resources, Western Governors should adopt and take necessary steps to implement the following actions. The recommendations are grouped according to federal, regional, state and local entities and industries that would implement the recommendations."⁶⁴

4.1.3 Selected States' Approaches⁶⁵

4.1.3.1 California

The Renewable Energy Transmission Initiative ("RETI")⁶⁶ is a statewide initiative to help identify the transmission projects needed to accommodate renewable energy goals, support future energy policy, and facilitate transmission corridor designation and transmission and generation siting and permitting. RETI is an open and transparent collaborative process in which all interested parties are encouraged to participate. RETI will assess all competitive renewable energy zones in California and possibly also in neighboring states that can provide significant electricity to California consumers by the year 2020. RETI also will issue a report to identify those zones that can be developed in the most cost effective and environmentally benign manner and will prepare detailed transmission plans for those zones identified for development.⁶⁷ The final report for Phase 1A was submitted on May 16, 2008.⁶⁸

⁶³ <http://www.westgov.org/wga/policy/06/clean-energy.pdf>

⁶⁴ Specific Recommendation available in *Clean Energy, a Strong Economy and a Healthy Environment*, June 11, 2006, www.westgov.org/wga_reports.htm

⁶⁵ For a survey of state transmission infrastructure authorities see : State Transmission Infrastructure Authorities: The Story So Far; December 2007 - December 2008 at: http://www.osti.gov/bridge/product.biblio.jsp?osti_id=928901

⁶⁶ <http://www.energy.ca.gov/reti/index.html>

⁶⁷ <http://www.energy.ca.gov/reti/index.html>

⁶⁸ <http://www.energy.ca.gov/2008publications/RETI-1000-2008-002/RETI-1000-2008-002-F.PDF>

4.1.3.2 Colorado

The Colorado Public Utilities Commission ("CPUC") hosted an informational meeting on July 24, 2007, to explore the connection between transmission development and implementation of state energy policies being developed by the state of Colorado. Senate Bill 100 was among the new legislation considered.⁶⁹ Colorado Senate Bill 100⁷⁰ requires rate regulated electric utilities to do the following on or before October 31 of each odd number year:

1. Designate "Energy Resource Zones,"
2. Develop plans for transmission necessary to deliver the electric power consistent with the timing of development of energy resources in or near each zone,
3. Consider how transmission can be provided to encourage local ownership of renewable energy facilities, and
4. Submit proposed plans, designations, and applications for certificates of public convenience and necessity to the CPUC for simultaneous review."

The Clean Energy Development Authority⁷¹ ("CEDA") was charged to develop a three year plan to accomplish the mandates of Colorado Senate Bill 100, and to work with the Colorado Public Utilities Commission and the Colorado Coordinated Planning Group ("CCPG"), a regional transmission study forum for the Rocky Mountain Region.⁷² The current schedule for the group is:

1. April-July 2008 - participate in transmission planning groups,
2. November 2008 - issue study plans based upon results,
3. November 2008-January 2009 - prepare Certificate of Public Convenience and Necessity ("CPCN") studies,

⁶⁹ Colorado Senate Bill SB 07-100, codified at C.R.S. § 40-2-126.

⁷⁰ WestConnect Planning Report page 36

⁷¹ Clean Energy Development Authority:
<http://www.colorado.gov/energy/utilities/clean-energy-development-authority.asp>

⁷² http://www.westconnect.com/planning_ccpg.php

4. March 2009 - file CPCN applications,
5. October 2009 - file transmission plans

4.1.3.3 Nevada

Renewable Energy Transmission Access Advisory Committee ("RETAAC") was created by Executive Order⁷³ of the Governor of Nevada. RETAAC was created because Nevada is a net importer of energy. The purpose of RETAAC⁷⁴ is to:

1. Identify and rank commercially developable locations for renewable energy
2. Assess existing and planned transmission access to these resources
3. Make recommendations for additional transmission

RETAAC established a phased work plan. The Phase 1 Report identified: Renewable Energy Zones ("REZ"), the transmission required for access to grid, and recommended transmission lines. Future phases will include more detailed environmental review.⁷⁵

4.1.3.4 New Mexico

In March 2007, the New Mexico legislature created a Renewable Energy Transmission Authority ("RETA"). The purpose of RETA is to develop a renewable energy generation and export industry, increase in-state electric system infrastructure reliability, and proactively pursue statewide electric transmission capital improvement planning and implementation. It is intended that RETA will orchestrate multi-state utility negotiations to facilitate the development of New Mexico's transmission infrastructure for renewable energy development and export,⁷⁶ and will focus on electric infrastructure planning

⁷³ http://gov.state.nv.us/EO/2008/EO-2008-06-12_RETAACII.pdf

⁷⁴ Nevada RETAAC: <http://gov.state.nv.us/Energy/FinalReport.htm>

⁷⁵ <http://gov.state.nv.us/Energy/FinalReport/RETAAC%20Phase%20I%20Report.pdf>

⁷⁶ 2007 WestConnect Planning Report, page 36

financing and development.⁷⁷ RETA will rely on revenue from the projects it initiates, not the state's faith and credit or General Fund.

To be eligible for RETA funding, at least 30% of a transmission project's energy must be renewable derived electricity. RETA has already engaged as a participant in the SWAT subregional transmission process. RETA has also been active in the SWAT New Mexico Study Group wind collector system study.

4.2 Mandatory Reliability Standards

In response to EAct 2005, FERC established rules⁷⁸ for certifying an electric reliability organization ("ERO"). On July 26, 2006, the NERC was designated as the nation's ERO for the purpose of establishing and overseeing a system of mandatory and enforceable electric system reliability standards.

On March 16, 2007, FERC approved 83 reliability standards of the 107 which were originally proposed and directed the improvement of 56 of the approved reliability standards.⁷⁹ In May 2007, FERC approved over 700 Violation Risk Factors for the NERC Reliability Standards. These mandatory reliability standards apply to users, owners and operators of the bulk power system designated by NERC through its compliance registry procedures. On July 19, 2007, the Commission issued a decision denying a request for rehearing of Order 693.⁸⁰

In April 2007, FERC approved NERC's *pro forma* Delegation Agreement – the blueprint for the contractual relationship between NERC and eight regional reliability entities ("RE"). The agreement includes a Compliance Monitoring and Enforcement Program to be used by NERC and regional entities to monitor, assess and enforce compliance with FERC approved mandatory reliability standards. Among the elements included in the compliance program are procedures for audits and investigation, mitigation plans and remedial actions, procedures to address settlements, complaint procedures, confidentiality requirements, penalties, and hearing and review procedures. The WECC has been authorized as one of the eight regional REs. The delegation agreement with the WECC was approved by FERC in June 2007.

⁷⁷ New Mexico Renewable Energy Transmission Authority: <http://www.nmreta.org/>

⁷⁸ FERC Order Nos. 672 and 672-A

⁷⁹ FERC Order No. 693

⁸⁰ <http://www.ferc.gov/whats-new/comm-meet/2007/071907/E-6.pdf>

On June 8, 2007, FERC approved eight proposed regional Reliability Standards for the WECC.⁸¹ The regional Reliability Standards apply in the Western Interconnection in addition to the 83 mandatory NERC reliability Standards. NERC and WECC are developing revisions to existing reliability planning standards and proposing the adoption of additional planning standards.⁸² These include proposed revisions to system performance standards that must be met during system planning studies and the planning process. The status of proposed revisions or new standards can be monitored on both the NERC and WECC websites.

Some transmission providers within the WestConnect planning area experienced compliance audits in 2007. Compliance with the NERC and WECC mandatory planning standards approved by FERC has been among the items audited. The mandatory reliability planning standards will continue to be a key consideration as new transmission study plans are prepared for the coming year.

4.3 FERC Siting Authority/National Interest Electric Transmission Corridor

EPAct 2005 Section 1221 added Section 216, of the Federal Power Act ("FPA"), providing for federal "backstop" siting of proposed construction or modification of electric transmission facilities under certain conditions and is located within a National Interest Electric Transmission Corridor ("NIETC") established by the Department of Energy.⁸³ On October 2, 2007, DOE issued its National Electric Transmission Congestion Report and order formally designating the Mid-Atlantic and Southwest National Corridors.⁸⁴ The Southwest NIETC includes seven counties in Southern California and three counties in western Arizona as depicted on Exhibit 38.

The NIETC designations were effective October 5, 2007, and will remain in effect until 2019 unless DOE rescinds, renews, or extends the designation after notice and opportunity for comment. There will be Western Interconnection planning activities required to support the congestion study required of DOE every three years. It is anticipated that this will largely be addressed by the congestion analysis performed by the Transmission Expansion Planning Policy Committee ("TEPPC"). A demonstration that "critical congestion" does not exist over the Southwest NIETC or that planned electric facilities effectively

⁸¹ <http://www.ferc.gov/EventCalendar/Files/20070608171203-RR07-11-000.pdf>

⁸² 2007 WestConnect Planning Report, pages 29-30

⁸³ <http://www.ferc.gov/industries/electric/indus-act/siting.asp>

⁸⁴ Federal Register / Vol. 72, No. 193 / Friday, October 5, 2007 / Notices

mitigate the DOE finding of “critical congestion” will likely be required for DOE to consider rescinding the Southwest NIETC before 2019.

On May 16, 2008, Southern California Edison submitted its initial filing with FERC⁸⁵ for the first application for a “backstop” permit to site the Palo Verde to Devers No.2 500kV transmission line. As stated in section 2.4.2, the ACC had previously denied SCE’s application for a Certificate of Environmental Compatibility on June 6, 2007, in Decision No. 69638.

4.4 DOE PEIS for Federal Energy Corridors in Western States

Section 368 of EPLA 2005 addresses energy right of way corridors on federal lands. Section 368 requires the Departments of Commerce, Defense, Energy and Interior to consult with each other and within 2 years:

1. Designate, under their respective authorities, corridors for energy facilities on Federal land in eleven contiguous Western States;
2. Perform any environmental reviews that may be required to complete the designation of such corridors; and
3. Incorporate the designated corridors into the relevant agency land use and resource management plans or equivalent plans.

In October 2007, the draft West-wide Energy Corridor PEIS⁸⁶ was issued. It evaluates potential impacts associated with the proposed action to designate energy corridors on federal land in Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. The final PEIS is scheduled for release the summer of 2008, with a Record of Decision (“ROD”) to be issued at least 30 days after the release of the final PEIS. The draft PEIS, maps of the proposed energy corridors and other support documents can be found on the West-wide Energy Corridor PEIS website.⁸⁷

After the issuance of a ROD, the agencies issuing the PEIS would amend their respective land use plans by designating a series of energy corridors. The energy corridors established by this process will

⁸⁵ FERC Docket No. PT08-01.

⁸⁶ Federal Register, Vol. 72, No. 221, November 16, 2007, *Notices* Section

⁸⁷ <http://www.corridoreis.anl.gov/index.cfm>

impact the siting of future planned electric infrastructure. SWAT has taken the initiative to begin exploring new emerging electric transmission corridor needs with federal land manager agencies.^{88,89}

4.5 FERC 890 Planning Principles

In February 2007, FERC amended its regulations and the *pro forma* open access transmission tariff ("*pro forma* OATT")⁹⁰, adopted in Order Nos. 888 and 889. This action was taken to remedy opportunities for undue discrimination and address deficiencies in the *pro forma* OATT. The final rule requires that:

1. Transmission providers participate in a coordinated, open and transparent planning process on both a local and regional level,
2. Each transmission provider's planning process meet FERC's nine planning principles, which are coordination, openness, transparency, information exchange, comparability, dispute resolution, regional coordination, economic planning studies, and cost allocation,
3. Each transmission provider must describe its planning process in its tariff, and
4. FERC allows regional differences in planning processes.

4.6 WestConnect

WestConnect is composed of electric utility companies⁹¹ providing transmission services throughout the southwestern United States. Its members work collaboratively to assess stakeholder and market needs and to develop cost-effective enhancements to the western wholesale electricity market. WestConnect is committed to coordinating its work with other regional industry efforts to achieve as much consistency as possible in the Western Interconnection. A WestConnect Steering Committee is

⁸⁸ SWAT Letter to US Forest Service, August 21, 2007

⁸⁹ 2007 WestConnect Planning Report, pages 32-34

⁹⁰ Preventing Undue Discrimination and Preference in Transmission Service, Order No. 890, 72 FR 12266 (March 15, 2007), FERC Stats. & Regs. ¶ 31,241 (2007), reh'g pending (Order No. 890).

⁹¹ The membership of WestConnect is available at: http://www.westconnect.com/about_steeringcomm.php

charged with the task of overseeing development and implementation of a variety of initiatives for the above stated purpose on behalf of the WestConnect members.⁹²

4.6.1 WestConnect Market Enhancement Initiatives

WestConnect is currently engaged in multiple market enhancement initiatives. The current initiatives are listed below. A BTA Workshop I presentation describing the status of each of these initiatives is posted on the Commission's website. These initiatives can also be monitored on an ongoing basis by subscribing to the WestConnect website newsletter.⁹³ The WestConnect Regional Planning initiative is most germane to the purpose of this report and is described in the following section of this report.

1. **Regional Pricing Experiment** - WestConnect has proposed a two year regional pricing experiment to eliminate rate pancaking for hourly non-firm transactions for participating WestConnect members. WestConnect filed a Petition for Declaratory Order with FERC seeking approval of its Regional Transmission Pricing Experiment to be effective in 2009.⁹⁴ FERC approved the requested tariff adjustments for the participating parties in a September 2008 decision.
2. **Virtual Control Area** - The goal of the Virtual Control Area Work Group ("VCAWG") is to investigate methods and technology available for coordinating control area operations to allow participating Control Areas to function as a Virtual Control Area. The VCAWG is currently in the process of joining the Northern Tier Transmission Group ("NTTG") Ace Diversity Interchange ("ADI") program with an expected confirmation date in the third quarter of 2008. The VSAWG is additionally looking at potential implementation of Contingency Reserves Sharing. Currently there are two existing reserve sharing groups within the WestConnect planning area. Reserve sharing has historically been limited by transfer capability between control areas, but an analysis of the current potential for reserve sharing is under consideration.
3. **Transmission Products** - The Transmission Products Work Group ("TPWG") is to investigate tariff products for transmission services that serve needs of market participants better than the traditional firm and non-firm point-to-point and network products specified by FERC. The TPWG

⁹² 2007 WestConnect Planning Report, page 3

⁹³ <http://westconnect.com/>

⁹⁴ http://www.westconnect.com/filestorage/petition_declaratory_order_wc_regional_pricing_experiment_060908.doc

is currently in the early stages of assessment of potential for standardization of planning redispatch practices.

4. **TTC/ATC Process** - This process periodically discloses the magnitude of Total Transfer Capability ("TTC") and associated Available Transmission Capacity ("ATC") on each WestConnect members posted transmission paths. The annual TTC/ATC stakeholder workshop was held on May 21, 2008, at APS headquarters in Phoenix, Arizona to update the TTC and ATC for WestConnect members posted transmission paths. The materials presented at the Workshop indicated limited ATC on major lines into the Phoenix metropolitan and Tucson areas.⁹⁵ Exhibit 8 shows transmission paths affecting Arizona in 2008 in diagram and tabular format. The transmission path consisting of lines between Arizona and California has the largest TTC of any established path in the Western Interconnection.⁹⁶
5. **Flow Based Market Initiatives** - A Flow Based Market Investigation Work Group ("FBMIWG") was formed to:
 - Investigate tools available to implement flow based scheduling in the WestConnect planning area,
 - Assess the costs and benefits of the implementation of various solutions, and
 - Recommend solutions if practical

Utilities in the Western Interconnection have traditionally allocated contract path rights for the use of the transmission systems they own or operate. These rights are defined based on the specific facilities over which energy is assumed to flow. By way of contrast, the actual flow on the system is dictated by the physical characteristics of the transmission system and not the contract. This leads to a mismatch between the actual flows and the assumed flows. The benefits of implementing a flow based scheduling and its related processes may generally include

⁹⁵ Agenda from the meeting with hyperlink to presentations,
http://www.westconnect.com/filestorage/WC_TTC-ATC_Workshop_Agenda052108.doc

⁹⁶ 2006 Fourth BTA

more accurate utilization of transmission facilities, a truer signal of congestion on specific lines, and greater utilization of the grid.⁹⁷

4.6.2 Regional Transmission Planning

In May 2007, transmission providers established a WestConnect subregional planning process by signing the WestConnect Project Agreement for Subregional Transmission Planning ("STP Agreement"). The STP Agreement established a Planning Management Committee ("PMC") made up of one representative of each of the signatory parties. The PMC is tasked with implementation of a subregional planning process that complies with the WestConnect Planning Objectives and Procedures for Regional Planning approved by the WestConnect Steering Committee on August 24, 2006.

WestConnect subregional transmission planning is being performed by SWAT, the Colorado Coordinated Planning Group ("CCPG") and any other subregional transmission planning ("STP") groups that forms and makes up the WestConnect planning area. APS, SRP, SWTC, TEP, and WAPA are among the WestConnect members and SWAT participants. SWAT subcommittees and study groups have been performing studies in response to Commission ordered study requirements for the BTA. A detailed description of the SWAT study effort for this BTA is provided in the next section of this report.

Annually a WestConnect ten year integrated regional transmission plan is derived from the subregional planning groups' study effort. The WestConnect Transmission Plan coordinates and assembles all ten year transmission plans across WestConnect planning area. The first WestConnect transmission plan and report was published in January of 2008 and is available on the WestConnect website.⁹⁸ An on line map of the 2007 WestConnect Transmission Plan is also available on the website.⁹⁹ The ten year plans of APS, SRP, SWTC, TEP and WAPA are displayed on the WestConnect map along with the transmission providers' plans for all or portions of the following states: Colorado, New Mexico, West Texas, Southern California Imperial Valley, northern California, and Nevada.

Beginning in 2008 WestConnect will commence performing two types of transmission studies for its members and participating stakeholders. The first study will be an annual adequacy study of the prior

⁹⁷ http://www.westconnect.com/init_flowbasedmkt.php

⁹⁸ http://westconnect.com/planning_final_report.php

⁹⁹ http://westconnect.com/planningmap_sm.php

year WestConnect transmission Plan.¹⁰⁰ The second study will be a biennial long range study.¹⁰¹ Both study efforts will yield information of interest to Arizona transmission providers and support their study requirements for Commission ordered BTA study work. The first Biennial Long Range Study will address transmission requirements for the entire WestConnect study area. The Adequacy Study and Biennial Long Range Study plans for WestConnect are included as Appendices G and H respectively.

4.7 SWAT Subregional Planning Group

SWAT is comprised of transmission regulators/governmental entities, transmission users, transmission owners, transmission operators and environmental entities. The goal of SWAT is to promote subregional planning in the Desert Southwest. The SWAT regional planning group includes seven main subcommittees which are overseen by the SWAT Oversight Committee. Separate web pages are provided for each of this subcommittees and the SWAT Oversight Committee on the WestConnect website.¹⁰² SWAT subcommittees' meeting notices, notes, presentations and reports are posted on their respective web pages. The following SWAT subcommittees under the leadership of the indicated chairmen have performed study work and produced reports that are crucial to this BTA:

Table 12 - SWAT Subcommittees Contributing to BTA

CRT Subcommittee – Ken Bagley	NM Subcommittee – Tom Duane
CATS EHV Subcommittee – Gary Romero	Short Circuit Working Group – David Wheeler
CATS HV Subcommittee – Joe Herrera	SATS Subcommittee – Ron Belval
Renewable Energy Trans Task Force – Peter Krzykos	

4.7.1 Colorado River Transmission Planning Group

The Colorado River Transmission subcommittee ("CRT") was formed to study the area within the geographic region straddling the Colorado River from southern Nevada to Yuma, Arizona. This study group includes the participation of: Arizona Power Authority, WAPA, Nevada Power Company, SCE, IID, California ISO, Los Angeles Department of Water and Power, APS, SRP, SWTC, TEP, CAP, and other

¹⁰⁰ WestConnect Annual Adequacy Study, Appendix H

¹⁰¹ WestConnect Biennial Long Range Study, Appendix G

¹⁰² SWAT website: http://westconnect.com/planning_swat.php

interested Stakeholders. The CRT study group is actively engaged in its first technical study of the Harcuvar Project.¹⁰³ The Harcuvar 230 kV Project interconnection with the Palo Verde to Devers No. 2 500 kV project investigation was still underway at the time of the BTA Workshop I. While no technical report was available during Workshop I, the proposed project was presented and discussed.

4.7.2 Central Arizona Transmission Study – High Voltage

The Central Arizona Transmission Study High Voltage ("CATS HV") study group includes the following utilities: APS, SRP, TEP, SWTC, ED-3, ED-4, ED-2, WAPA and San Carlos Irrigation Project. The CATS HV study area consists of the high voltage transmission system in Pinal County. Using a local stakeholder process CATS HV performed a study in 2007 that investigated the ability of the local system to serve the forecast load for 2016 and beyond. The study group performed studies and issued an original report in August of 2007 which was supplemented with an October 2007 addendum to the report that refined study results and considered the impact of the upgrade of WAPA transmission lines in Pinal County.¹⁰⁴ These reports have been filed with the Commission by SWAT and a presentation was given at the BTA Workshop I.

This BTA references the study reports as offering initial insights to the SIL and MLSC of Pinal County. The CATS HV study references a total load for the State of Arizona in 2016 as 24,819 MW. The 2016 CATS HV Study indicates that Pinal County is capable of serving 200 to 600 MW of load growth beyond that forecast for 2016. The quantity of load growth that can be accommodated beyond 2016 depends upon whether WAPA's local 115 kV lines are upgraded to 230 kV. The CATS HV 2008 study plan is focused on considering generation development scenarios in Pinal County using a 2018 power flow base case.

4.7.3 Central Arizona Transmission Study – Extra High Voltage

The Central Arizona Transmission Study Extra High Voltage ("CATS EHV") study group has the most longevity as a coordinated transmission planning forum in Arizona. Arizona transmission providers that participate in the CATS EHV study group are APS, SRP, SWTC, TEP and WAPA. Over the past few years

¹⁰³ As described in Section 2.4.3 of this report

¹⁰⁴ Impacts of Ten year Plan Transmission Projects and Sensitivity to Local Load Growth, approved August 20, 2007

this SWAT study group has shouldered a large portion of the burden of performing the Commission ordered transmission studies for the BTA process.

The CATS EHV study group performed three studies of the Arizona transmission system during 2007. Reports of each study have been filed in support of the ten year plans filed by Arizona transmission providers. The results of each study are discussed in Section 3 of this BTA report. The following studies were conducted by CATS EHV to establish the adequacy of the ten year plans and were presented at the 2008 BTA Workshop I.¹⁰⁵

- Tenth Year Snap Shot Study (2016) – considers N-0, N-1 contingencies and N-1-1 analysis of the ten year planned projects.
- 2011 and 2016 RMR for the Metropolitan Phoenix Area filed with the APS Ten Year Plan.
- A Common Corridor and Extreme Contingencies study report were filed by SWAT as a confidential document.

4.7.4 Short Circuit Working Group

The SWAT Short Circuit Working Group ("SCWG") was formed for the purpose of developing a coordinated short circuit study model of the SWAT subregional area transmission system. This study tool is needed to enable a consolidated and coordinated short circuit model that yields consistent and accurate short circuit results. The tools and model developed by the SCWG are needed by transmission planning groups and by transmission providers performing system impact studies for proposed interconnections. A workshop was held in May 2008 and has produced a coordinated Aspen¹⁰⁶ based short circuit case. The case is currently out for review and comment. The new coordinated and consolidated SWAT short circuit case will be updated and revised on an on-going basis.

4.7.5 Southeast Arizona Transmission Study

The SWAT Southeast Arizona Transmission Study ("SATS") Subcommittee was formed to study the Southeastern Arizona region. The SATS study area encompasses the southeastern portion of Pinal

¹⁰⁵ [http://www.azcc.gov/Divisions/Utilities/Electric/Biennial/2008%20BTA/SRP%20ACC BTA Workshop-Directed%20Work.ppt](http://www.azcc.gov/Divisions/Utilities/Electric/Biennial/2008%20BTA/SRP%20ACC%20BTA%20Workshop-Directed%20Work.ppt)

¹⁰⁶ Aspen is a short circuit analysis program

County, southern Graham County, most of Pima and all of Cochise Counties and Santa Cruz County. The following transmission providers are participants in the study process:

Table 13 - SATS Participating Transmission Providers

Arizona Public Service Company	Southwest Transmission Cooperative
Central Arizona Project	Tucson Electric Power
El Paso Electric Company	Western Area Power Administration
Public Service Company of New Mexico	US Bureau of Reclamation

Numerous local load serving entities and other stakeholders have been participating in the SATS study process. These entities include Fort Huachuca Military Reservation Sulphur Springs Valley Electric Cooperative, Trico Electric Cooperative, and UniSource Electric. Graham County Electric Cooperative is the only local load serving entity in the study area that has not participated.

The primary objective of SATS is to have a 20 year transmission plan covering the SATS study area. An agreement to conduct the study as a "single system" was established as a key principle for the study. The 2007 SATS study efforts were ambitious and yielded considerable preliminary findings. Completion of the current study plan will yield a long range transmission plan for southern Arizona that will compliment the original Long Range Plan conceived for central Arizona by the original CATS study group. In the meantime, the SATS study has shaped the ten year plans reported by the participating utilities for inclusion in the 2007 WestConnect Transmission Plan.¹⁰⁷ Several versions of a draft report are located on the WestConnect website.¹⁰⁸

The SATS Studies have also shaped the ten year transmission plans filed with the Commission in January 2008. For the first time an extensive portfolio of EHV and HV transmission plans are being filed for Southern Arizona. Many of the projects that are surfacing in the ten year plans have in-service dates of TBD because they are the result of a saturated load study of the area. The SWTC and TEP systems are going through major additions of facilities in the ten year period and need to move to completion of

¹⁰⁷ http://www.westconnect.com/filestorage/WestConnect_Planning_Report_FINAL.pdf, page 15

¹⁰⁸ The most current revision of the SATS at the time of this report is Version 9,
http://westconnect.com/filestorage/SATS%20Report%20Draft9_Clean.pdf

this coordination study effort and determine an estimate of the in-service dates of facilities that would fit within the ten year time period that is the subject of a BTA.

5. CONCLUSIONS

The quantity and quality of industry reports and Commission ordered BTA study results available for the BTA process has progressively increased over the past ten years. The body of reference documents and presentations available for this BTA is among the best filed with the Commission to date. The industry's commitment and focus on supplying transmission plans and associated information addressing issues and concerns of importance to the Commission is self evident. A wide range of public policy concerns regarding reliable service to Arizona have been addressed over the ten years that the BTA process has been active. The conclusions of this BTA are organized to answer four key policy questions:

- Is the existing and planned Arizona transmission system adequate to reliably meet the load serving requirements of the state during the 2008-2017 timeframe?
- Do the Reliability Must Run, N-1-1, Extreme Contingency, and Renewable Energy Transmission Assessment studies sufficiently address the Commission's concerns embodied in prior BTA ordered study requirements?
- Do the most recent transmission planning studies effectively address concerns raised in previous BTAs about the adequacy of the state's transmission system to reliably support the competitive wholesale market within Arizona?
- Are the planning processes being utilized consistent with transmission planning principles and good utility practices accepted by the power industry and the reliability planning standards established by NERC and WECC?

5.1 Adequacy of System to Reliably Serve Local Load

The existing and proposed Arizona transmission system meets the load serving requirements of the state in a reliable manner. However, plans for the last five years of the period are less well defined than those in the earlier five years. As such there are system performance issues that occasionally still need attention in the last five years. There is still sufficient time to refine the planned improvements to mitigate those concerns.

1. The 2008 level of preparedness of the three major utilities in Arizona appears to be high and above the norm. None of the concerns that have existed in prior summer preparedness Open Meetings

over the past decade were present in 2008. The current electric utility system in Arizona is adequate and, based upon the assumptions contained herein, should meet the energy needs of the state in 2008 with reliable service.

2. The simultaneous import limit ("SIL") and maximum load serving capability ("MLSC") of local load pockets is one measure of the transmission system ability to serve load reliably. The SIL and MLSC should increase over time, commensurate with the load growth. If this is not occurring then there becomes an increasing dependency upon local reliability must run ("RMR") generation. As long as the RMR generation is already economically dispatched in merit order then the system can be judged as adequate and reliable.
 - a. The existing and planned transmission systems serving the Phoenix, Santa Cruz County, Tucson, and Yuma areas are adequate and should reliably meet the local energy needs of the respective areas through 2017. This conclusion is supported by the following SIL, MLSC and RMR determinations:
 - i. The SIL and MLSC limit for the Phoenix, Santa Cruz County, Tucson, and Yuma areas increases between 2008 and 2016. These improvements are achieved by the construction of planned transmission improvements contained in this BTA.
 - ii. The 2011 and 2016 peak load forecasts for the Phoenix, Santa Cruz County, Tucson, and Yuma areas exceed each respective area's SIL capability. This implies RMR conditions will exist for these areas.
 - b. Pinal County is capable of serving 200 to 600 MW of load growth beyond that forecast for 2016. The quantity of load growth that can be accommodated beyond 2016 depends upon whether WAPA's local 115 kV lines are upgraded to 230 kV. It would be helpful for future studies of this area to establish SIL, MLSC and RMR indicators as defined by the Commission.
 - c. The adequacy level of the Mohave County system is unclear due to controverted conclusions reached in multiple publicly available study reports. It would be helpful for future studies of this area to establish SIL, MLSC and RMR indicators as defined by the Commission.
3. Santa Cruz County and Cochise County are served by radial transmission lines. Growing numbers of customers are, therefore, exposed to extended service interruptions following the loss of a single transmission line in these two counties. The ability of these two areas to restore service to

customers within a reasonable period of time following a transmission line outage has been a long standing concern of the Commission. Transmission improvements that assure "continuity of service"¹⁰⁹ for loss of a single transmission line is a public policy that needs to be adopted to replace the "restoration of service" practice present in these two counties.

- a. UNSE efforts to permit and construct a second line to Santa Cruz County have stalled due to lack of a NEPA Record of Decision ("ROD") from federal agencies and issuance of a Presidential Permit. UNSE installed a 20 MW generator in Nogales in 2004 and plans to upgrade its existing 115 kV line to 138 kV in 2013 as interim solutions to ensure the ability to restore service. However, Santa Cruz County remains exposed to service outages for all of its UNSE customers following the loss of the radial transmission line serving the county. Some of those customers will experience extended periods of service interruption for that transmission line outage. The amount of load that cannot be restored for loss of the critical transmission line section grows from 9 MW in 2008 to 36 MW in 2016. Additional transmission line improvements outlined in the UNSE Ten Year Plan for Santa Cruz County are contingent upon resolving the pending federal permitting matter.
- b. The Cochise County load, from Ft. Huachuca to Douglas, is served via four radial transmission lines. The loss of any one of these lines during summer peak could result in the inability of one or more of the load serving entities (APS, TEP, and SSVEC) in this area to serve their entire load. TEP cannot restore service to 6 MW of its 22 MW load for Fort Huachuca in 2008. Therefore, the Fort is seeking an emergency tie with SSVEC. APS also anticipates it may need a second 69 kV emergency tie with SSVEC within the next ten years. Both of these emergency ties with SSVEC, although desirable for restoration of service, are placing additional burden on the SSVEC 69 kV system that is no longer able to operate as a network because of radial transmission line limitations. All of these actions perpetuate a restoration of service approach to transmission line outages as opposed to continuity of service.
- c. The Fourth BTA documented that N-1 contingency violations occurred for loss of the Apache to Butterfield 230 kV line, the Butterfield to San Rafael 230 kV line, or the Pantano to Kartchner 115 kV line in the SWTC 2015 planning study. The Commission granted SWTC a time extension until January 2008 to resolve these three Cochise County N-1 contingency violations and to file expansion plans that resolve those issues as part of its 2008-2017 ten year plan. The most

¹⁰⁹ Defined in Appendix F of the Fifth BTA

recently filed SWTC ten year plan proposes to loop the existing WAPA Nogales Tap to Adams 115 kV line into Pantano. This is the same line that provides service to APS in Cochise County. SWTC also proposes a new radial 230 kV line from Sloan to Huachuca with an undetermined in-service date. Staff concludes this proposed new line is not an adequate transmission solution because it perpetuates radial transmission service and "restoration of service" practices in Cochise County through at least 2026.

5.2 Efficacy of Commission Ordered Studies

All Commission required studies have been filed. APS and TEP filed RMR studies; SRP filed SWAT studies that address N-1-1 contingencies and extreme contingency studies performed by the CATS-EHV study group, and a CATS-HV Study of Pinal County; and SRP filed a SWAT Renewable Transmission Task Force Report. The results of these studies and associated reports are discussed in detail in Section 3 of this BTA report. SWTC and TEP have also responded to the requirement that they file transmission plans and analysis addressing specific deficiencies in the Fourth BTA. The following conclusions apply to the efficacy of the filed documents relative to the intent of the Commission ordered action:

1. In general the RMR studies show that each RMR area will have sufficient maximum load serving capability to reliably serve the respective area's load during the next ten year period. The RMR studies also indicate local RMR generation will not be dispatched out of merit order for significant hours or yield RMR costs sufficient to warrant advancing transmission improvements. The efficacy of each respective RMR study is as follows:
 - a. The Phoenix area, Tucson area and Yuma area RMR studies were thorough and well documented. These studies comport with the Commission's RMR study methodology and production cost simulations were performed using industry accepted study tools and publicly available data. No flaws in assumptions or modeling are evident in these three reports.
 - b. The Phoenix area study results reflect a system perspective of transmission import and RMR analysis for the Phoenix metropolitan area for all the local generation and three local transmission providers: APS, SRP and WAPA.
 - c. The focus of the Yuma area RMR study is solely based on the import to the local APS 69 kV system. There needs to be a system perspective of the RMR conditions for the entire Yuma County area in the future rather than limiting the RMR analysis solely to the APS 69 kV system.

This is particularly true given that the SIL and MLSC import limits to the APS system are restricted by the overloads on other transmission providers' systems. This is underscored by the fact that major system changes are being proposed for the area by other interconnected entities such as WAPA, WMIID, IID and parties seeking LGIA interconnections in the area.

- d. The August 7 amended Tucson area RMR report establishes that RMR conditions continue to exist in the Tucson area even as new transmission improvements occur. However, the cost of additional transmission improvements required solely to mitigate or eliminate residual RMR costs is not economically justified.
 - e. Future RMR studies for Mohave County RMR need to establish SIL, MLSC, and RMR indicators that comport with the Commission's RMR Study Methodology.
2. A Ten Year Snap Shot Study, and N-1-1 Study, and Extreme Contingency Study were performed by the CATS – EHV study group. TEP also modeled corridor outages and extreme contingencies in its RMR studies. The filed studies were thorough and well documented. The studies comport with the study effort outlined by Commission Staff. The context of the N-1-1 study for the tenth year was modified to be a special planned project N-1-1 study. These studies generally indicated the ten year plan is sufficiently robust to provide adequate and reliable service to Arizona. The following key conclusions were derived from these studies:
- a. No thermal overloads or voltage problems existed in the 2016 base case.
 - b. Only four single contingencies resulting in sixteen WAPA line overloads were unresolved by the Ten Year Snapshot study.
 - d. The N-1 analysis showed 67 buses with greater than five percent voltage deviation. The underlying transmission system is not sufficiently modeled in the case to accurately determine the actual voltage deviation resulting from an N-1 contingency in 2016. The study could not determine if these deviations were realistic or as severe as reported.
 - e. The special N-1-1 analysis removed a planned transmission project and then ran single contingency outages. This analysis is more strenuous than the WECC and NERC N-1-1 criteria. The thermal loading and voltage deviation results for these contingencies showed that all planned projects produced adverse impacts if omitted from the ten year plan. Removing the APS

Raceway to Avery 230 kV project from the case is the only project that did not produce additional or increased overloads above what was found in the N-1 analysis.

- f. TEP studied corridor outages and loss of major TEP hubs for its 2008 RMR Study. TEP's normal operating procedures include the ability to survive the studied corridor outages utilizing a Tie Open Load Shed scheme. Study results show that TEP can survive these extreme contingencies under the 2008 system condition.
 - g. The CATS EHV Subcommittee studied its assigned group of extreme contingencies for 2009 and 2016. In 2009 all customer loads can be served and local Phoenix reserve requirements met for all extreme outages studied. Some outages would require generation redispatch from other available sources. Some outages would require limited local system reconfiguration to alleviate overloads. Without system reconfiguration, outages of corridors into Pinnacle Peak would require local load reduction. The 2016 outage of the Cholla-Saguaro and Coronado-Silver King 500 kV lines or the Glen Canyon to Flagstaff to Pinnacle Peak 345 kV lines causes a reduction of Phoenix import capability. A portion of the forecasted load could not be served for these 2016 corridor outages. WECC and NERC reliability standards allow load shedding schemes for such extreme contingencies.
3. The SWAT Renewable Task Force Report was filed for this BTA in compliance with the fourth BTA Order. A supplement to the original report was filed on August 6, 2008, in response to the BTA Workshop I request. These reports and the associated BTA Workshop I presentation document the stakeholder process that the task force utilized to assemble an industry perspective regarding the renewable energy development potential in Arizona. The industry's response comports with the Commission's Order by:
- a. Documenting Available Transfer Capacity ("ATC") data gathered for each utility in Arizona,
 - b. Developing a renewable resource map displaying areas where renewable resource development could potentially occur, and
 - c. Providing a map depicting new transmission lines that conceptually might be needed to transport energy from the potential renewable resources to the major load pockets in Arizona.

The SWAT Renewable Task Force is now actively engaged in technical studies that consider the conceptual renewable collector systems identified for Arizona, New Mexico and Nevada. In 2009,

WestConnect will perform technical studies that consider the integration of renewable energy development throughout the entire WestConnect planning area. These two efforts will compliment and support the WGA West-wide Renewable Energy Zone study that is expected to be completed in 2010.

4. TEP did address the Fourth BTA speculation that the "Tucson area RMR requirements could be eliminated and the load area have open access to lower cost resources from the outside market if incremental upgrades are justified."¹¹⁰ The 2008 TEP RMR Study indicates that even though a Static Var Compensator was installed at Northeast Loop Substation and the Westwing to South 500 kV line was interconnected at Pinal West, the 1,950 MW 2008 SIL is still limited by voltage instability for loss of both Saguaro to Tortolita 500 kV lines. TEP also reports that its transmission import schedule ability in 2008 is also limited to 1,949 MW via the Pinal West to South 345 kV line, Saguaro to Tortolita 500 kV lines and the Springerville to Vail 345 kV lines.
5. SWTC did file a ten year plan that resolved contingency violations that occurred for loss of the Apache to Butterfield 230 kV line, the Butterfield to San Rafael 230 kV line, or the Pantano to Kartchner 115 kV line in its 2015 planning study.¹¹¹ The most recently filed SWTC ten year plan proposes to loop the existing WAPA Nogales Tap to Adams 115 kV line into Pantano and build a new radial 230 kV line from Sloan to Huachuca with an undetermined in-service date.

5.3 Adequacy of System to Reliably Support Wholesale Market

Regional and subregional planning studies have effectively addressed the interconnected EHV transmission that is critical to a functional interstate wholesale market. Studies indicate the existing and planned Arizona EHV system is adequate to support a robust wholesale market.

1. Six major EHV transmission projects are proposed and have been addressed in this BTA. Individually and collectively these projects will improve the opportunity for interstate commerce.
 - a. The 500 kV DC TransWest Express Project and High Plains Express Project conceptually interconnect the Desert Southwest with Wyoming.

¹¹⁰ Decision No. 69389, Item 6.f, page 4

¹¹¹ Ibid, Item 9, page 5

- b. The SunZia 500 kV Project and Diné Power Authority 500 kV Navajo Transmission Project provide additional transmission capacity between Arizona and New Mexico.
 - c. The planned 500 kV Palo Verde to Devers No. 2 Project and 500 kV Palo Verde to North Gila No. 2 Project also provide additional transmission capacity between Arizona and California.
2. The following ongoing planned upgrades to existing EHV facilities increases the transmission system capability to support increased interstate power transfers and provide reliable transfers within the state of Arizona.
 - a. Short term upgrades to the Palo Verde to North Gila #1 and Palo Verde to Devers #1 500 kV lines in 2006 increased Path 49 rating by 505 MW. This path is now rated at 8,055 MW
 - b. Upgrades to the Navajo to Crystal 500 kV line in 2008 and the Mead Perkins 500 kV line in 2009 will increase Path 49 rating by an additional 1,245 MW. The resulting Path 49 rating will be 9,300 MW.
 - c. Path 54 rating will increase by 400 MW in 2009 with upgrades to the 500 kV Coronado Transmission System associated with the Springerville Units 3 and 4.
 - d. The 500 kV Navajo Southern Transmission System upgrades in 2010 will increase Path 51 rating by 800 MW.
3. In addition a Seams Issues Subcommittee ("SIS") report "finds no specific seams issues that are created by MRTU or existing seams issues that are substantially worsened by MRTU implementation. Seams issues exist today, particularly between organized markets such as the California Independent System Operator ("CISO") and bilateral physical markets that dominate the Western Interconnection. The SIS will continue to monitor, evaluate and propose solutions to all regional seams issues."¹¹²

5.4 Suitability of Utilized Planning Processes

The state of Arizona is fortunate its transmission providers are engaged in and providing leadership to the SWAT and WestConnect subregional planning processes. These planning forums utilize an open,

¹¹² APS 2008 BTA Docket Filing, "Seams Issues Subcommittee Report of Findings – Seams Issues Evaluation-California Independent System Operator-Market Redesign and Technology Upgrade", October 4, 2007, page 2

transparent and collaborative approach to transmission planning. Stakeholder participation has been broad based and inclusive of all parties that desire to engage in the planning process. Arizona's BTA would be impossible without access to an effective subregional transmission planning forum that dependably performs studies in support of the BTA. Arizona's transmission providers have effectively addressed all study requirements for this BTA. The following observations and conclusions indicate that minor refinements and enhancements in the subregional planning processes will continue to evolve as stakeholder needs change.

1. This is the first BTA to address planned transmission facilities resulting from the studies being performed by the SATS Subcommittee. This accounts for the increased number of new projects filed in the 2008 SWTC and TEP ten year plans. A large number of planned TEP and SWTC projects do not have an established in-service date. The planned in-service date for SWTC and TEP projects that will occur during the ten year planning cycle need to be resolved in order for proper modeling in future power flow base cases.
2. Planning of local transmission improvements (115 kV through 230 kV) has traditionally been left to the respective transmission providers. New local transmission planning processes are now beginning to emerge that are open to stakeholders' participation:
 - a. SATS is the first SWAT Subcommittee to study and coordinate local HV and EHV transmission system plans in a common forum. This approach to subregional planning has merit and may be well suited for other local areas in Arizona.
 - b. FERC Order 890 now requires transmission providers to plan their local system via open and transparent processes that engage stakeholders in a participatory manner. This local planning approach is comparable to what SWAT and WestConnect do on a subregional basis.
3. The CRT Subcommittee is engaged in its first formal study as a SWAT Subcommittee. It is looking at the Harcuvar Project interconnection with the Palo Verde to Devers No. 2 line. It would be helpful if CRT adopted SATS subregional planning approach and addressed the local HV needs of Mohave County and Yuma County along with the EHV transmission interfaces between Arizona, Nevada, and California.

6. RECOMMENDATIONS

The concerns outlined by Staff in the above conclusions can be resolved. Based upon the concerns expressed in the conclusions, Staff offers the following recommendations for Commission consideration and action:

1. It is recommended that the Commission continue to support the use of "Guiding Principles for ACC Staff Determination of Electric System Adequacy and Reliability take the following steps to foster refinements and improvements in subregional transmission planning forums needed and used for future BTAs:
 - a. Arizona transmission providers are to explore formation of subregional planning forums that assume the responsibility of addressing the local HV and EHV transmission import and RMR conditions in Mohave County and Yuma County. Such study forums need to be compatible with and supportive of FERC Order 890 local transmission provider planning obligations.
 - b. APS is to file a Yuma County RMR study report with the next BTA that continues to incorporate the plans of all entities proposing to interconnect and do business in Yuma County.
 - c. Unisource Electric ("UNSE") and Mohave Electric Cooperative ("MEC") are to collaborate with other stakeholders and UNSE shall file a Mohave County RMR study report with the next BTA that includes the impacts, influences, and system performance of all proposed local HV and EHV transmission improvements and potential generation interconnections occurring in the area. MEC shall provide all necessary MEC system data to UNSE to perform the RMR study
2. It is recommended that the SWAT Renewable Transmission Task Force transmission study report and the WestConnect Long Range Planning Study report be filed with the Commission within 30 days of completion to supplement the renewable transmission assessments filed with this BTA.
3. Staff recommends that the Commission order the following action to resolve concerns unresolved by this BTA:
 - a. The SATS long range study is envisioned to be completed in 2008. This study is predominantly shaping the ten year plans filed with the Commission for SWTC and TEP. Therefore, a final report is to be filed by TEP on behalf of all SATS participants by January 2009.

- b. TEP and SWTC are to resolve all "to be determined" (TBD) in-service dates for facilities envisioned to be constructed within the next ten years. The ten year plans filed by TEP and SWTC in January 2009 are to incorporate such resolved in-service dates. Plans that fall beyond the ten year horizon may be included in subsequent ten year plan filings but need to be identified as not occurring within the ten year horizon if a TBD date designation is used.
- c. UNSE is to perform studies and file a report of those studies for the next BTA that establishes a long range system plan for Santa Cruz County that is founded on the principle of continuity of service following a transmission line outage. Elements of that plan are to be incorporated in the UNSE ten year plan with a defined in-service date and filed with the Commission in January 2009.
- d. APS, SSVEC, and TEP are to perform collaborative studies and file a report of those studies for the next BTA that establishes a long range system plan for Cochise County that is founded on the principle of continuity of service following a transmission line outage. SWTC shall participate in the study effort as SSVEC's current sole transmission service provider. Relevant elements of that plan are to be incorporated in each transmission service provider's respective ten year plans with a defined in-service date and filed with the Commission in January 2010.

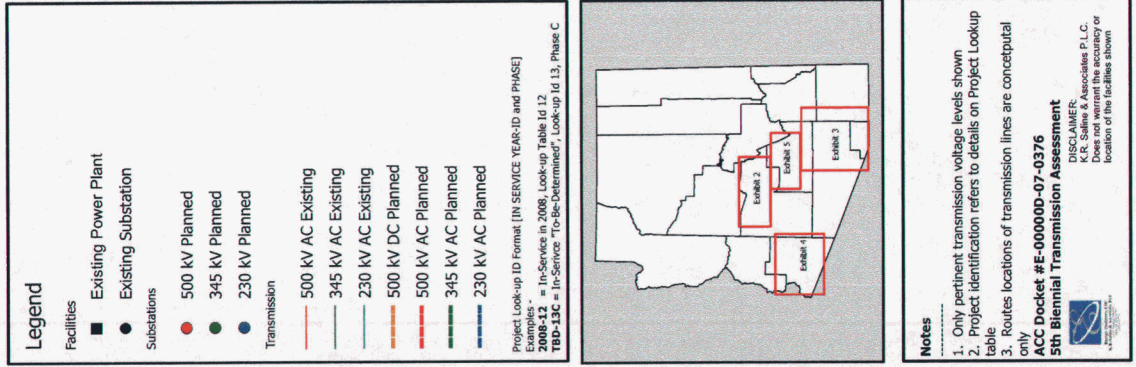
Exhibits

Fifth Biennial Transmission Assessment 2008-2017

Table of Exhibits

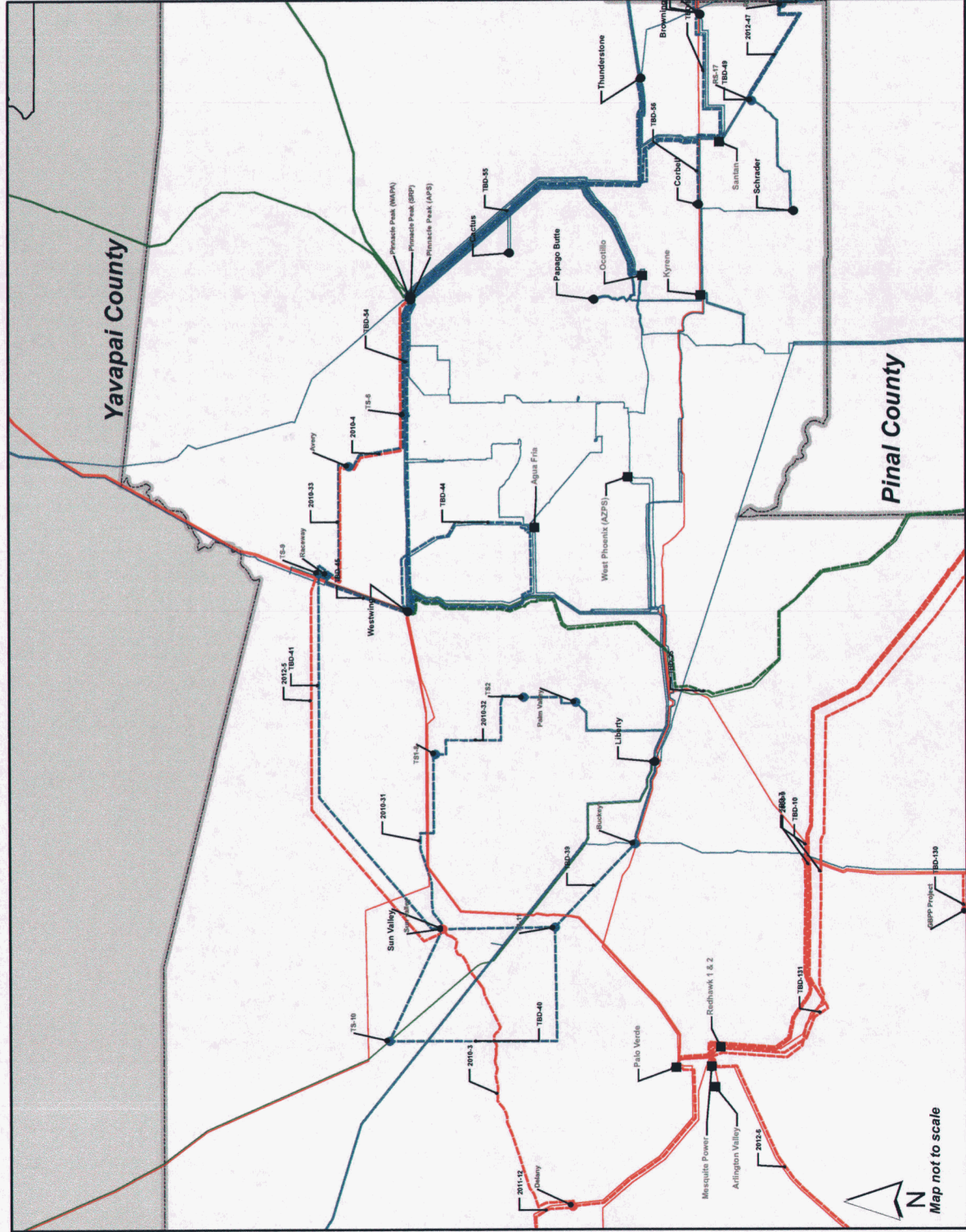
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Exhibit 35 – Arizona Renewable Energy Task Force Map #1
Exhibit 36 – Arizona Renewable Energy Task Force Map #2
Exhibit 37 – Arizona Renewable Energy Task Force Map #3
Exhibit 38 – NIETC Corridor Map

Exhibit 1



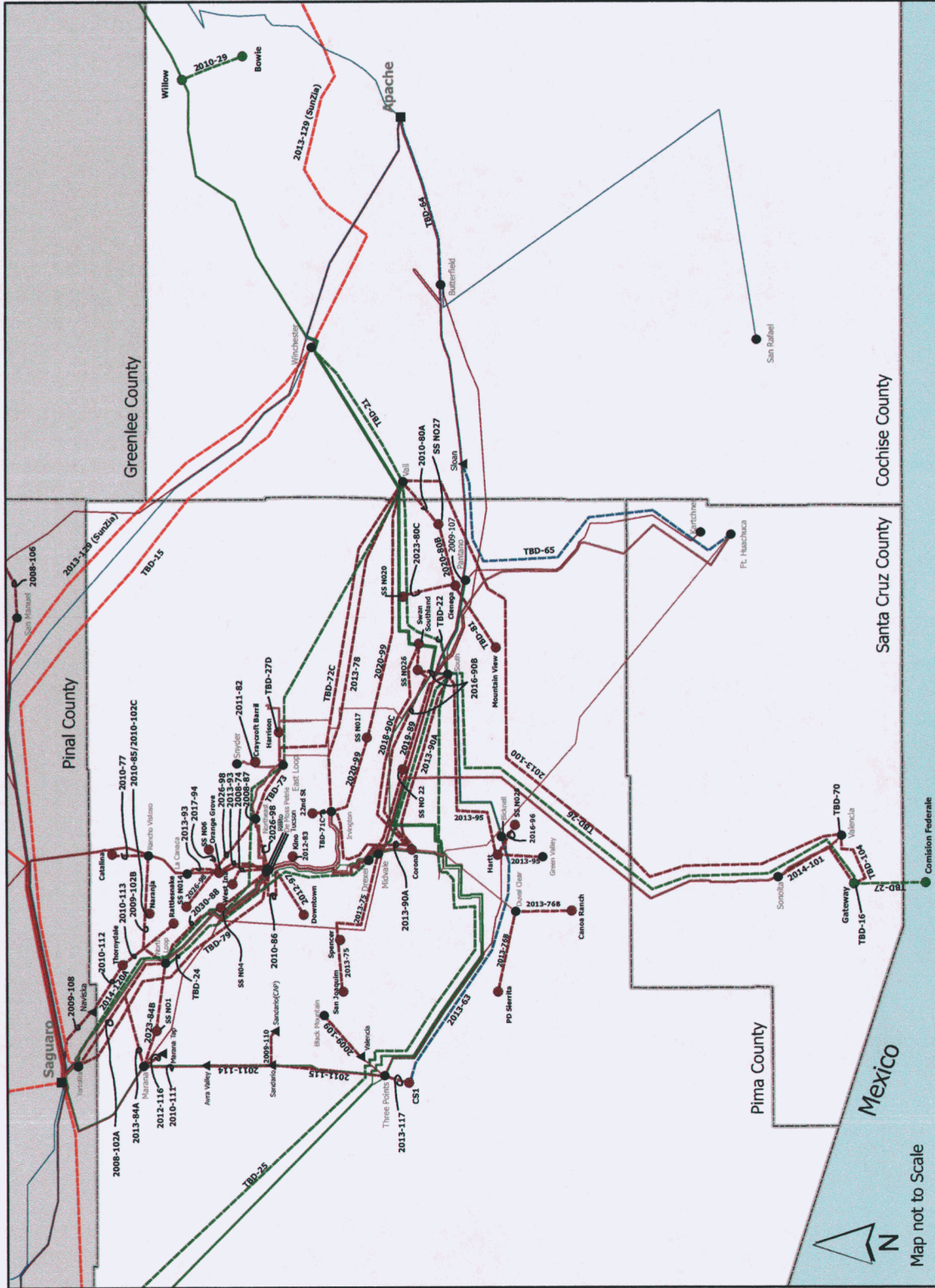
Metro Phoenix Planned and Existing Transmission above 230kV

Exhibit 2



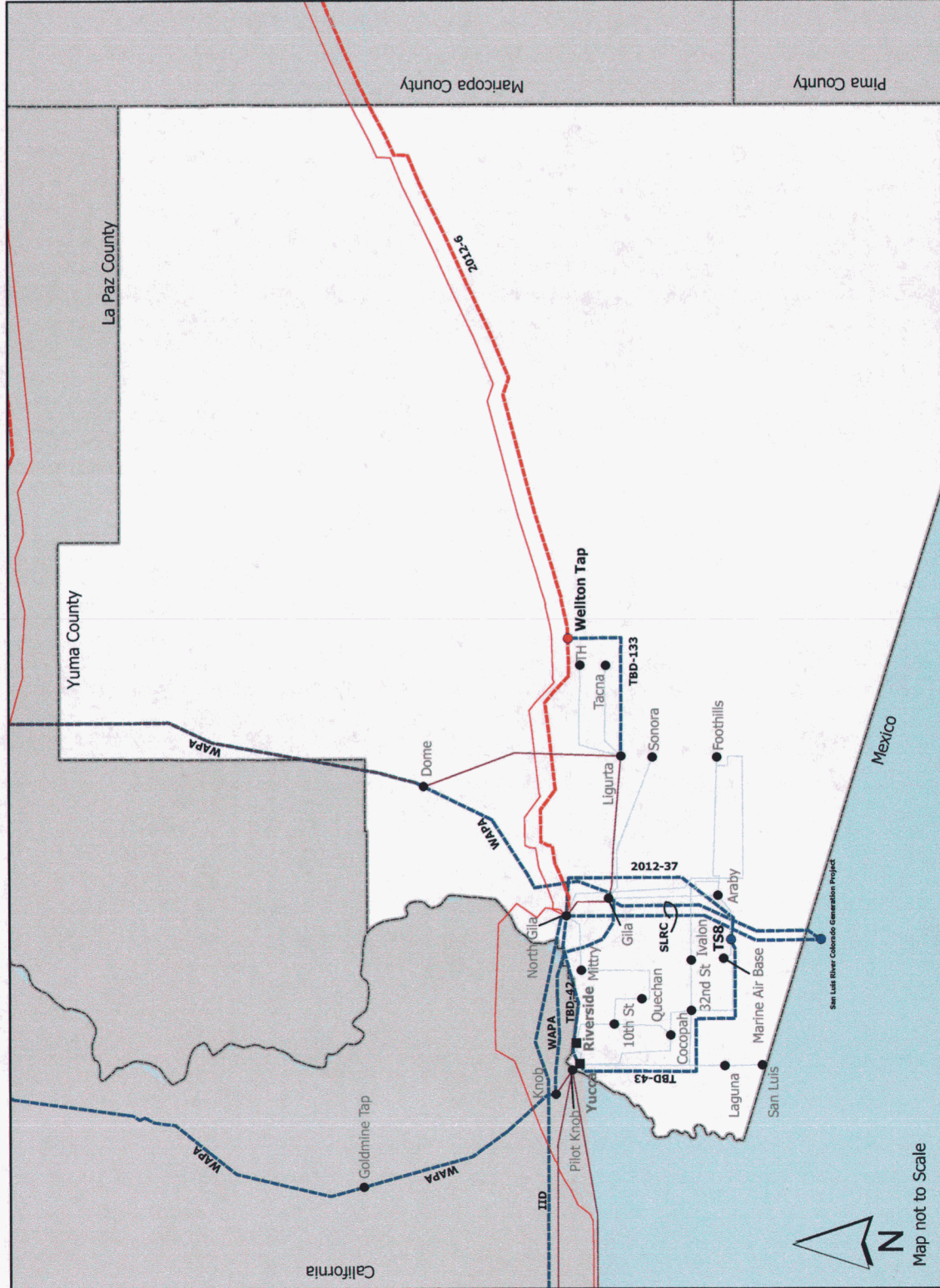
Existing and Planned Southeastern Arizona Transmission System

Exhibit 3



Yuma County Transmission System Above 69 kV

Exhibit 4



Legend

- Facilities**
- Existing Power Plant
 - Existing Substation
 - Planned Substation

- 500 kV Planned
- 345 kV Planned
- 230 kV Planned
- 138 kV Planned

Transmission

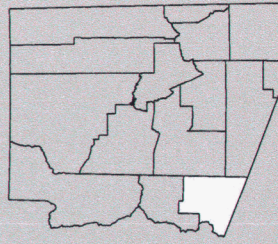
- 500 kV AC Existing
- 161 kV AC Existing
- 69 kV AC Existing
- 500 kV AC Planned
- 230 kV AC Planned

Project Look-up ID Format [IN SERVICE YEAR-ID and PHASE]

Examples:

2008-12 = In-Service in 2008, Look-up Table Id 12

TBD-13C = In-Service "To-Be-Determined", Look-up Id 13, Phase C



Notes

- Only pertinent transmission voltage levels shown
- Project identification refers to details on Project Lookup table
- Routes locations of transmission lines are conceptual only

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DISCLAIMER:
The information shown on this map is for informational purposes only. It does not warrant the accuracy or location of the facilities shown.

Exhibit 5

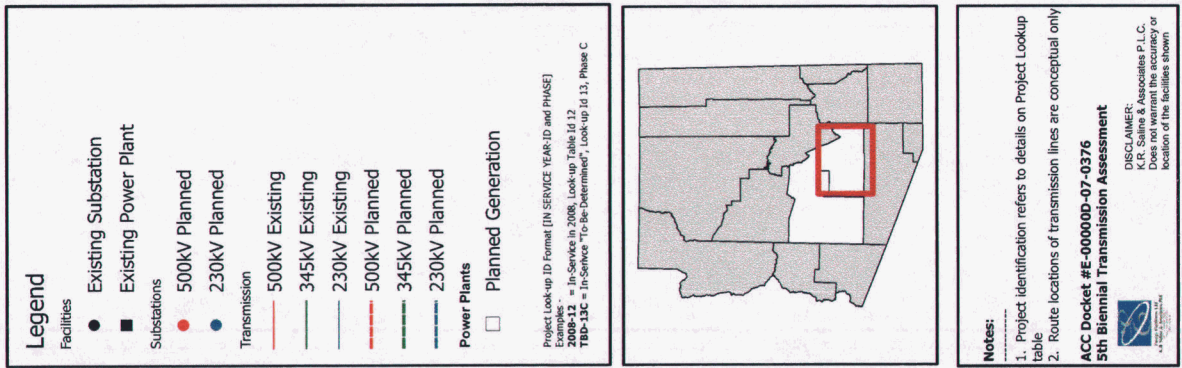


Exhibit 6 – Arizona Planned Project Lookup Table

Reference #	Description	Participants	Mileage	Permitting/Siting Status
2008-102A	Tortolita-North Loop-Rancho Vistoso Project - Phase 1 - Tortolita-North Loop	TEP	14.30	CEC Not Yet Filed
2008-106	Apache/Hayden-San Manuel 115 kV line	SWTC	4.50	CEC Not Yet Filed
2008-134	Interconnection of Westwing-South 345kV with future Hassayampa-Pinal West 500 kV	TEP	1.00	CEC Approved - Case #124
2008-66	Griffith-North Havasu 230 kV line	UNISOURCE	40.00	CEC Approved/Extended - Case #88
2008-67	Golden Valley 230 kV Project - McConico-Mercator Mill 230 kV line	UNISOURCE	20.00	CEC Not Yet Filed
2008-74	Loop existing West Ina -Tucson 138 kV line	TEP	0.95	CEC Approved - Case #62
2008-87	Northeast 138 kV Static Var Compensator (SVC)	TEP	0.00	CEC Not Required
2008-9	Hassayampa-Pinal West 500 kV #1 line	SRP, TEP, SWTC,ED2,ED3, ED4	51.00	CEC Approved – Case #124
2009-1	Sugarloaf Loop-in of Coronado-Cholla 500 kV line	APS, SRP	0.95	CEC Not Required
2009-102B	Tortolita-North Loop-Rancho Vistoso Project - Phase 2 - North Loop-Rancho Vistoso	TEP	11.10	CEC Not Yet Filed
2009-107	Western 115 kV line loop-in to Pantano	SWTC	0.20	CEC Not Required
2009-108	Saguaro-Naviska 115 kV line	SWTC	3.20	CEC Not Yet Filed
2009-109	Valencia-CAP Black Mountain 115 kV line	SWTC	2.60	CEC Not Yet Filed
2009-110	CAP 115 kV line loop-in to SWTC Sandario	SWTC	0.60	CEC Not Required
2009-2	VW01 Loop-in of Navajo-Westwing 500 kV line	APS	0.95	CEC Not Required
2009-30	Milligan Loop-in of Saguaro-Casa Grande 230 kV line	APS	0.95	Not Required
2010-102C	Tortolita-North Loop-Rancho Vistoso Project - Phase 3 - Corridor Expansion	TEP	18.00	CEC Not Yet Filed
2010-111	Marana-Avra Valley 115 kV Line Upgrade	SWTC	8.75	CEC Not Yet Filed
2010-112	Naviska-Thornysdale 115 kV line	SWTC	7.00	CEC Not Yet Filed
2010-113	Thornysdale-Rattlesnake 115 kV line	SWTC	19.00	CEC Not Yet Filed
2010-17	345/69 kV Interconnection at Western's Flagstaff 345 kV bus	APS	0.95	CEC Not Required
2010-28	White Hills substation	UNISOURCE	0.00	CEC Not Required
2010-29	Bowie Power Project	BOWIE	15.00	CEC Approved – Decision #64626

2010-3	Palo Verde Hub-Sun Valley 500 kV line	APS, SRP, CAWCD	45.00	CEC Approved – Decision #68063
2010-31	Sun Valley-TS1 - 230 kV line	APS	15.00	CEC Approved – Decision #67828
2010-32	Palm Valley-TS2-TS1 230 kV line	APS	12.00	CEC Approved - Decisions #66646 and #67828
2010-33	TS9-Raceway-Avery-TS6-Pinnacle Peak 230 kV line	APS	27.00	CEC Approved – Decision #69343
2010-4	TS9-Pinnacle Peak 500 kV line	APS, SRP	26.00	CEC Approved – Decision #69343
2010-77	Rancho Vistoso-(Future) Catalina 138 kV line	TEP	3.50	CEC Not Required
2010-80A	Vail-SS NO27-Cienega-SSNO22-Spanish Trail Project - Phase 1 - Vail-Cienega 138 kV line	TEP	12.20	CEC Not Yet Filed
2010-85	North Loop-Rancho Vistoso 138 kV tap for future Naranja substation	TEP	24.50	CEC Not Yet Filed
2010-86	DeMoss Petrie-Tucson 138 kV line	TEP	4.50	CEC Not Yet Filed
2011-11	Pinal West-Southeast Valley-Browning 500 kV line	SRP, TEP, SWTC, ED2, ED3, ED4	50.00	CEC Approved - Case #126
2011-114	Avra Valley-Sandario Tap 115 kV Line Upgrade	SWTC	2.80	CEC Not Yet Filed
2011-115	Sandario Tap-Three Points 115 kV Line Upgrade	SWTC	13.71	CEC Not Yet Filed
2011-12	Devers - Palo Verde 500 kV #2 line	SCE	230.00	CEC Denied - Case #130
2011-14	Pinal Central-Tortolita 500 kV line	TEP, SWTC	30.00	CEC Not Yet Filed
2011-18	Mazatzal Loop-in of Cholla-Pinnacle Peak 345 kV line	APS	0.95	CEC Not Required
2011-34	SE10 Loop-in of Saguaro-Casa Grande 230 kV line	APS	0.95	Not Required
2011-35	Desert Basin-Pinal South 230 kV	APS, SRP	21.00	CEC Approved – Decisions #68093, #68291, #69183 and #69647
2011-36	Sundance-Pinal South 230 kV line	APS, ED2	6.00	CEC Filed – Case #136
2011-46	Pinal South-Southeast Valley/RS22	SRP	30.00	CEC Approved - Decisions #68093 and #69291
2011-82	Northeast-Snyder 138 kV Tap for Craycroft-Barril substations	TEP	8.00	CEC Not Required
2012-116	Marana Tap-Marana 115 kV Line Upgrade	SWTC	0.20	CEC Not Required
2012-13	Moenkopi-Eldorado 500 kV Series Capacitor Upgrade Project	SCE, APS	0.00	CEC Not Required
2012-37	North Gila-TS8 230 kV line	APS	15.00	To be Filed in 2008
2012-47	RS17-RS24 230 kV line	SRP	TBD	CEC Not Yet Filed
2012-48	RS24-RS22/SEV 230 kV line	SRP	TBD	CEC Not Yet Filed
2012-5	Sun Valley-TS9 500 kV line	APS, SRP, CAWCD	TBD	CEC Not Yet Filed
2012-6	Palo Verde Hub-North Gila 500 kV #2 line	APS, SRP, IID, WMIDD	110.00	CEC Approved – Decision #70127

2012-83	Irvington-Tucson 138 kV Tap for future Kino substation	TEP	10.90	CEC Not Yet Filed
2012-97	Tucson-Downtown 138 kV line	TEP	1.00	CEC Not Yet Filed
2013-100	Upgrade existing 115 kV transmission line to Nogales	UNISOURCE	60.00	CEC Not Yet Filed
2013-117	CS1-Three Points 115 kV line	SWTC	0.50	CEC Not Yet Filed
2013-129	SunZia Project	SWPG, SRP, TEP, ECP, Shell	500.00	CEC Not Yet Filed
2013-38	Jojoba Loop-in of TS4-Panda 230 kV line	APS	0.95	CEC Approved – Decision #62960
2013-63	Future CS1-Bicknell 230 kV line	SWTC	21.00	CEC Not Yet Filed
2013-75	Extend Midvale-(Future) Spencer-(Future) San Joaquin 138 kV line	TEP	20.00	CEC Not Yet Filed
2013-76B	South-Duval CLEAR - Phase 2b - Extend 138 kV line from Canoa Ranch-(Future) Duval	TEP	24.00	CEC Approved - Case #84
2013-78	Irvington-Vail 138 kV #2 line	TEP	5.00	CEC Not Yet Filed
2013-84A	Tortolita-Marana-North Loop Project - Phase 1 - Tortolita-Marana 138 kV line	TEP	22.00	CEC Not Yet Filed
2013-90A	Irvington-South Project - Phase 1 - Irvington-Corona-South 138 kV line	TEP	16.10	CEC Not Yet Filed
2013-93	La Canada-Orange Grove-Rillito 138 kV line	TEP	5.40	CEC Not Yet Filed
2013-95	South-Hart-Green Valley 138 kV line	TEP	14.50	CEC Not Yet Filed
2014-101	Gateway-Sonoita 138 kV line	UNISOURCE	10.00	CEC Not Yet Filed
2014-120A	Tortolita-Vail 345 kV Project - Phase 1 - Tortolita-North Loop line	TEP	60.00	CEC Not Yet Filed
2016-90B	Irvington-South Project - Phase 2 - Corona-SS N026-South 138 kV line	TEP	13.10	CEC Not Yet Filed
2016-96	Hart-SS N029 138 kV line	TEP	7.10	CEC Not Yet Filed
2017-94	Orange Grove-SS N06 138 kV line	TEP	3.60	CEC Not Yet Filed
2018-90C	Irvington-South Project - Phase 3 - Corona-Swan Southlands and Swan Southlands-SS NO 26 138 kV lines	TEP	16.10	CEC Not Yet Filed
2019-89	Midvale-SS N022-South 138 kV line	TEP	13.00	CEC Not Yet Filed
2020-80B	Vail-SSN027-Cienega-SSN022-Spanish Trail Project - Phase 2 - Vail-SSN027 138 kV line	TEP	5.30	CEC Not Yet Filed
2020-99	Vail-SS N017-Irvington 138 kV line	TEP	10.00	CEC Not Yet Filed
2023-80C	Vail-SSN027-Cienega-SSN022-Spanish Trail Project	TEP	14.00	CEC Not Yet Filed

	- Phase 3 - Cienega-SSN020 138 kV line			
2023-84B	Tortolita-Marana-North Loop Project - Phase 2 - Marana-SSN01-North Loop 138 kV line	TEP	13.50	CEC Not Yet Filed
2026-98	DeMoss Petrie-SS N014-Northeast 138 kV line	TEP	13.50	CEC Not Yet Filed
2030-88	North Loop-SS N04-Demoss Petrie 138 kV line	TEP	15.80	CEC Not Yet Filed
TBD-10	Hassayampa - Pinal West 500 kV #2 line	SRP, TEP, SWTC, ED2, ED3, ED4	51.00	CEC Approved - Case #124
TBD-103	RS26-Fountain Hill substation	SRP	TBD	CEC Not Yet Filed
TBD-104	Nogales Transmission line #2	UNISOURCE	3.00	CEC Approved - Case #111
TBD-105	Point on Kearny-Hayden 115 kV line to Future Hayden	SRP	0.75	CEC Not Yet Filed
TBD-130	Gila Bend Power Plant	GBPP	0.00	CEC Approved - Case#109 - Extension Expires 4/2011
TBD-131	Hassayampa-Jojoba 500 kV line	GBPP	19.00	CEC Approved - Case#119 - Extension Request Pending
TBD-132	Test Track-Empire-ED4 230 kV line	WAPA, SCWPDA	20.00	CEC Not Required
TBD-133	Wellton-Mohawk 230 kV Line Project	WMIDD	35.00	CEC Not Yet Filed
TBD-15	Tortolita-Winchester 500 kV line	TEP	80.00	CEC Approved - Case #23
TBD-16	Gateway 345/115 kV or 345/138 kV substations	UNISOURCE	0.00	CEC Approved - Case #111
TBD-19	Greenlee switching station through Hidalgo to Luna	ELPE, PNM, TXNMPC	28.00	CEC Approved - Case #21
TBD-21	Winchester-Vail 345 kV line - 2nd circuit	TEP	40.00	CEC Not Yet Filed
TBD-22	Vail-South 345 kV line - 2nd circuit	TEP	14.00	CEC Not Required
TBD-2-20B	Tortolita-Vail 345 kV Project - Phase 2 - North Loop-East Loop line	TEP	0.00	CEC Not Yet Filed
TBD-23	Springerville-Greenlee 345 kV line - 2nd circuit	TEP	110.00	CEC Not Yet Filed
TBD-24	Tortolita-South 345 kV line	TEP	68.00	CEC Approved - Case #50
TBD-25	Westwing-South 345 kV line - 2nd circuit	TEP	178.00	CEC Approved - Case #15
TBD-26	Interconnection line -South-future Gateway 345 kV line	TEP, UNISOURCE	60.00	CEC Approved - Case #111
TBD-27	Future Gateway-Comision Federale de Electricidad 345 kV line	TEP	2.00	CEC Approved - Case #111
TBD-31-B	Sun Valley-TS1 - 230 kV line # 2	APS	15.00	CEC Approved - Decision #68063
TBD-3-20C	Tortolita-Vail 345 kV Project - Phase 3 - East Loop-Vail line	TEP	0.00	CEC Not Yet Filed
TBD-32-B	Palm Valley-TS2-TS1 230 kV line # 2	APS	12.00	CEC Approved - Decision #67828
TBD-39	Sun Valley-TS11-Buckeye 230 kV line	APS	TBD	CEC Not Yet Filed

TBD-40	Sun Valley-TS10-TS11 230 kV line	APS	TBD	CEC Not Yet Filed
TBD-41	Sun Valley-TS9 230 kV line	APS	TBD	To be filed in 2008
TBD-42	North Gila-Yucca 230 kV line	APS	TBD	CEC Not Yet Filed
TBD-43	Yucca-TS8 230 kV line	APS	TBD	CEC Not Yet Filed
TBD-44	Westwing-El Sol 230 kV line	APS	11.00	CEC Approved – Docket#U-1345
TBD-45	Westwing-Raceway 230 kV line	APS	7.00	CEC Approved – Decision#64473
TBD-49	RS17 230 kV Loop-in line	SRP	0.95	CEC Approved - Decisions #59791 and #60099
TBD-50	Dinosaur-RS21 230 kV line	SRP	TBD	CEC Not Yet Filed
TBD-51	Rogers-Browning 230 kV line	SRP	9.00	CEC Not Yet Filed
TBD-52	Silver King-Browning 230 kV line	SRP	38.00	CEC Approved - Case #20
TBD-53	Silver King-Browning/Superior 230 kV tie	SRP	0.50	CEC Not Yet Filed
TBD-54	Westwing-Pinnacle Peak 230 kV line	APS, SRP	22.00	CEC Approved – Decision #64473
TBD-55	Pinnacle Peak-Brandow 230 kV line	SRP	TBD	CEC Approved - Case #69
TBD-56	Rogers-Corbell 230 kV line	SRP	12.00	CEC Not Required
TBD-57	Silver King-Knoll-Future Hayden 230 kV line	SRP	35.00	CEC Not Yet Filed
TBD-58	Santa Rosa-ED5 230 kV line	SCWPDA, SPPR	38.00	CEC Not Yet Filed
TBD-59	ED5-Pinal South (Pinal Central) 230 kV line	SCWPDA, SPPR	18.00	CEC Not Yet Filed
TBD-60	ED5-Marana 230 kV line	SCWPDA, SPPR	28.00	CEC Not Yet Filed
TBD-61	Pinal Central (Pinal South) - Future substation 6 miles northeast 230 kV line #1	SCWPDA, SPPR	6.00	CEC Not Yet Filed
TBD-62	Pinal Central (Pinal South) - Future substation 6 miles northeast 230 kV line #2	SCWPDA, SPPR	6.00	CEC Not Yet Filed
TBD-64	Upgrade of Apache-Butterfield 230 kV line	SWTC	16.00	CEC Not Yet Filed
TBD-65	Future Sloan-Huachuca 230 kV line	SWTC	24.00	CEC Not Yet Filed
TBD-7	Palo Verde-Saguaro 500 kV line	CATS Sub-regional Planning Group	130.00	CEC Approved – Decision#46802
TBD-70	Valencia 115 kV substation expansion	UNISOURCE	0.00	CEC Approved - Case #111
TBD-71C	Irvington-East Loop Project - Phase 3 - Irvington-22nd Street 2nd Circuit	TEP	9.00	CEC Approved - Case #66
TBD-72C	Vail-East Loop - Phase 3 - Third Vail-East Loop 138 kV line	TEP	22.00	CEC Approved - Case #8
TBD-72D	Vail-East Loop - Phase 4 - Harrison Tap of Roberts-East Loop 138 kV line	TEP	0.00	CEC Approved - Case #8
TBD-73	East Loop-Northeast 138 kV line	TEP	13.00	CEC Approved - Case #47
TBD-79	Tortolita-Rillito 138 kV line	TEP	24.50	CEC Not Yet Filed

TBD-8	Arlington Power Plant		Dynegy Arlington Valley	TBD	CEC Approved – Decision #64357
TBD-81	Future Cienega-Mountain View 138 kV line		TEP	4.70	CEC Not Yet Filed

Arizona Extreme Contingency Map

Exhibit 7

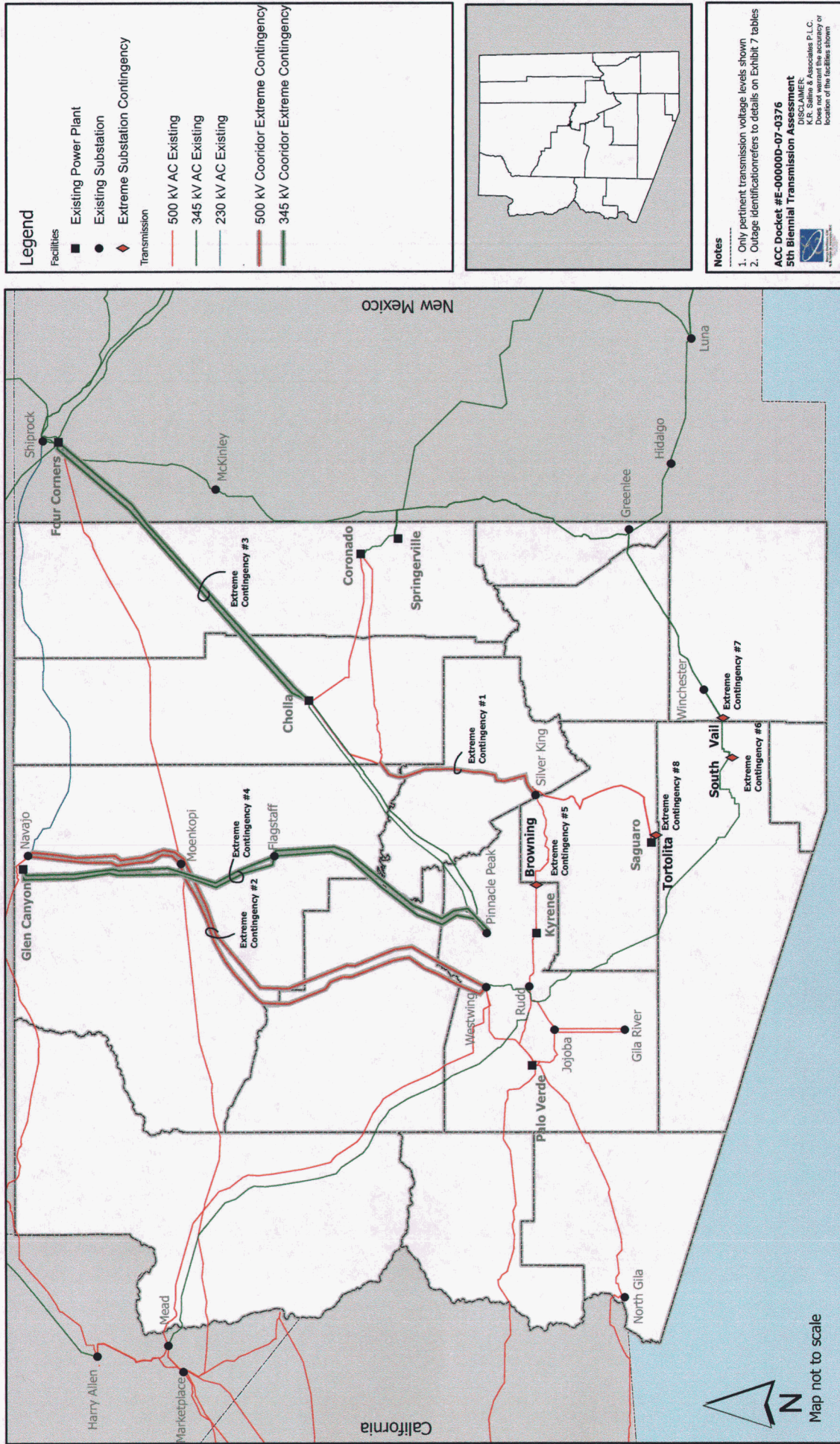


Exhibit 7 Table - Extreme Contingency Listing

Reference	Outage(s)
1	Cholla-Saguaro and Coronado-Silverking 500kV lines
2	Navajo South 500kV lines
3	Four Corners-Cholla-Pinnacle Peak 345kV lines
4	Glen Canyon-Flagstaff-Pinnacle Peak 345kV lines
5	Browning 500/230 kV Transformer Bank
6	EHV Transformers at South
7	EHV Transformers at Vail
8	EHV Transformers at Tortolita

WECC Paths Affecting Arizona Map

Exhibit 8

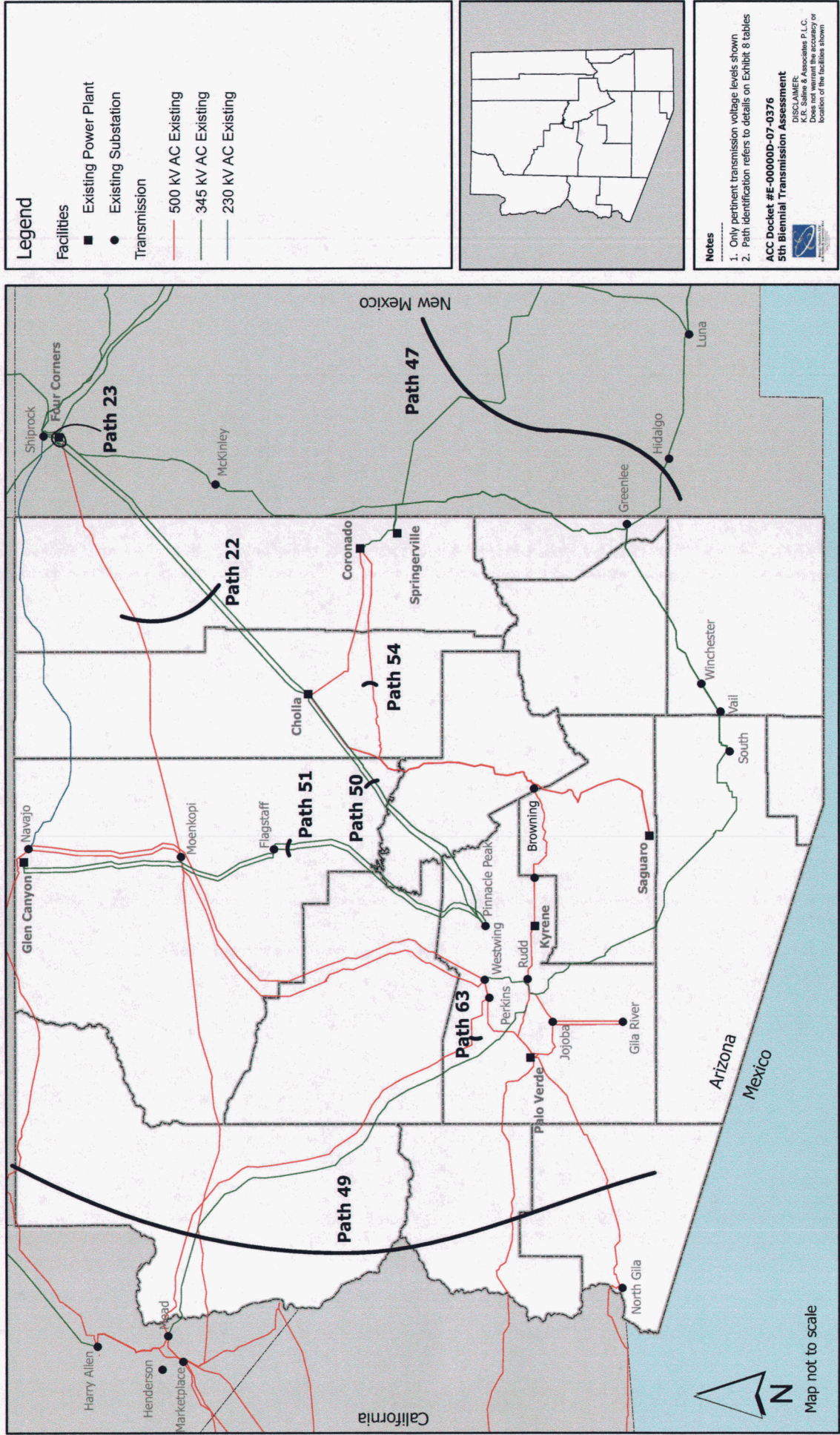


Exhibit 8 Table - WECC Path Information¹

WECC Path	WECC Path Name	Components	2008 Rating
22	Southwest of Four Corners	Four Corners - Moenkopi 500 kV	2325 MW (nominal)
		Four Corners - Cholla 345 kV #1	
		Four Corners - Cholla 345 kV #2	
23	Four Corners 345/500 Qualified Path		345 to 500: 840 MVA
		Flow on 345/500 Transformer	500 to 345: 840 MVA
47	Southern New Mexico	West Mesa - Arroyo 345 kV	940 MW (Simultaneous Firm)
		Springerville - Luna 345 kV	1048 MW (Non-simultaneous)
		Greenlee - Hidalgo 345 kV	
		Belen - Bernardo 115 kV	
48	Northern New Mexico	Four Corners - West Mesa 345 kV	1849 MW (Simultaneous Firm)
		San Juan - BA 345 kV	1970 MW (Non-simultaneous)
		San Juan - Ojo 345 kV	
		McKinley/Yah-Ta-Hey 345/115 kV Transformer	
		Walsenburg - Gladstone 230 kV	
		Bisti - Ambrosia 230 kV	
49	East of River (EOR)	Navajo - Crystal - McCullough 500 kV	8055 MW (Non-simultaneous)
		Moenkopi - El Dorado 500 kV	
		Liberty - Peacock - Mead 500 kV	
		Palo Verde - Devers 500 kV	
		Hassayampa - North Gila 500 kV	
		Perkins - Mead 500 kV	
50	Cholla - Pinnacle Peak	Cholla - Pinnacle Peak 345 kV # 1	East to West: 1200 MW
		Cholla - Pinnacle Peak 345 kV # 2	West to East: Not Rated
51	Southern Navajo	Moenkopi - Yavapai 500 kV	North to South: 3200 MW
		Navajo - Westwing 500 kV	South to North: Not Rated
54	Coronado - Silver King		East to West: 1133 MW
		Coronado - Silver King 500 kV	West to East: Not Rated
63	Perkins - Mead 500 kV Line (Part of Path 49)	Mead - Perkins 500 kV	East to West: 1300 MW
		Mead 500/230 Transformer	
		Perkins Phase Shifters	West to East: Not Rated

¹ WECC 2008 Path Rating Catalog,
http://www.wecc.biz/documents/library/reports/2008/Path2008_Final_0208.pdf

Exhibit 9 – Navajo Transmission Project Map

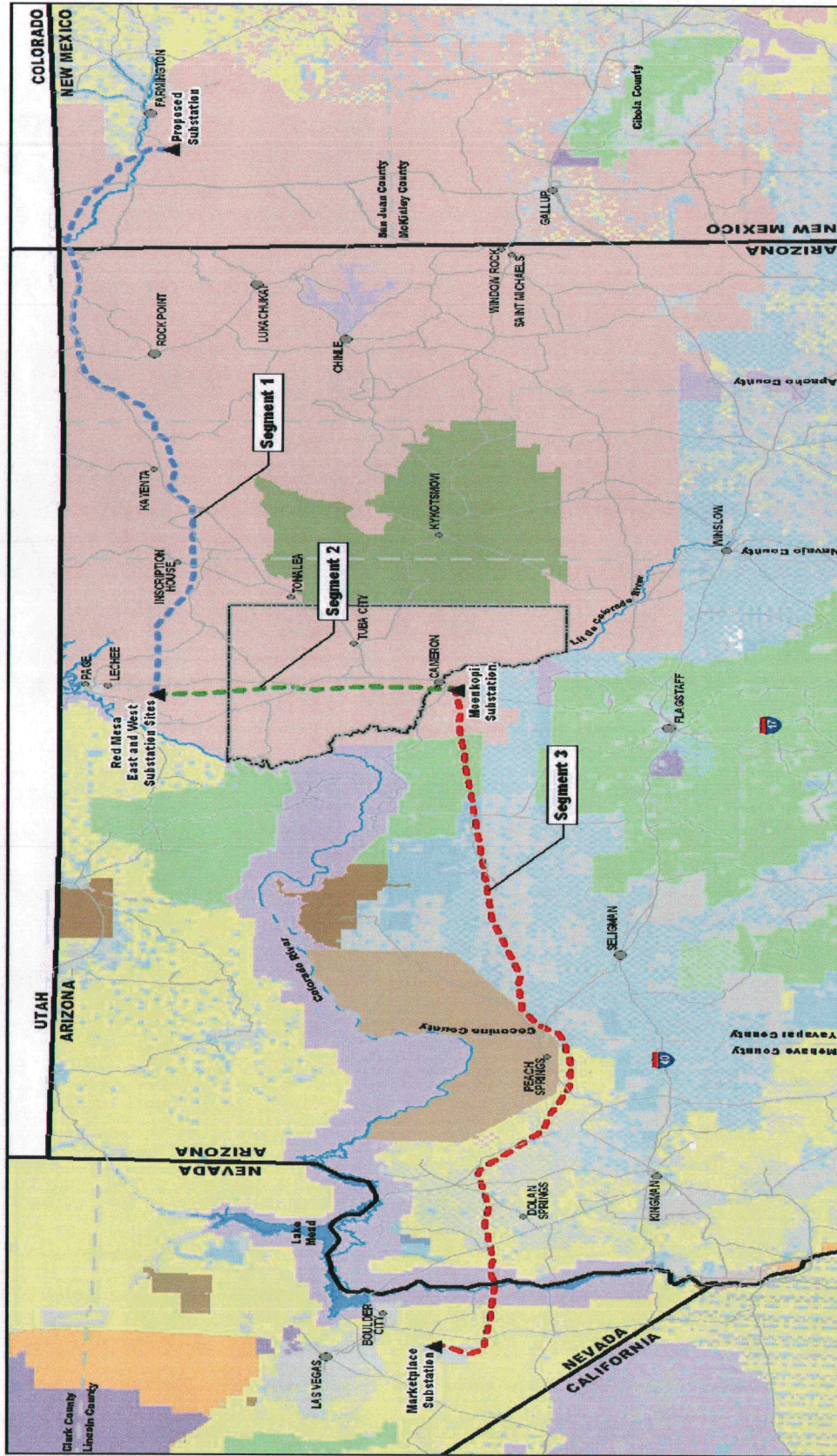


Exhibit 10 – Palo Verde-Devers 2 Transmission Line Project Map

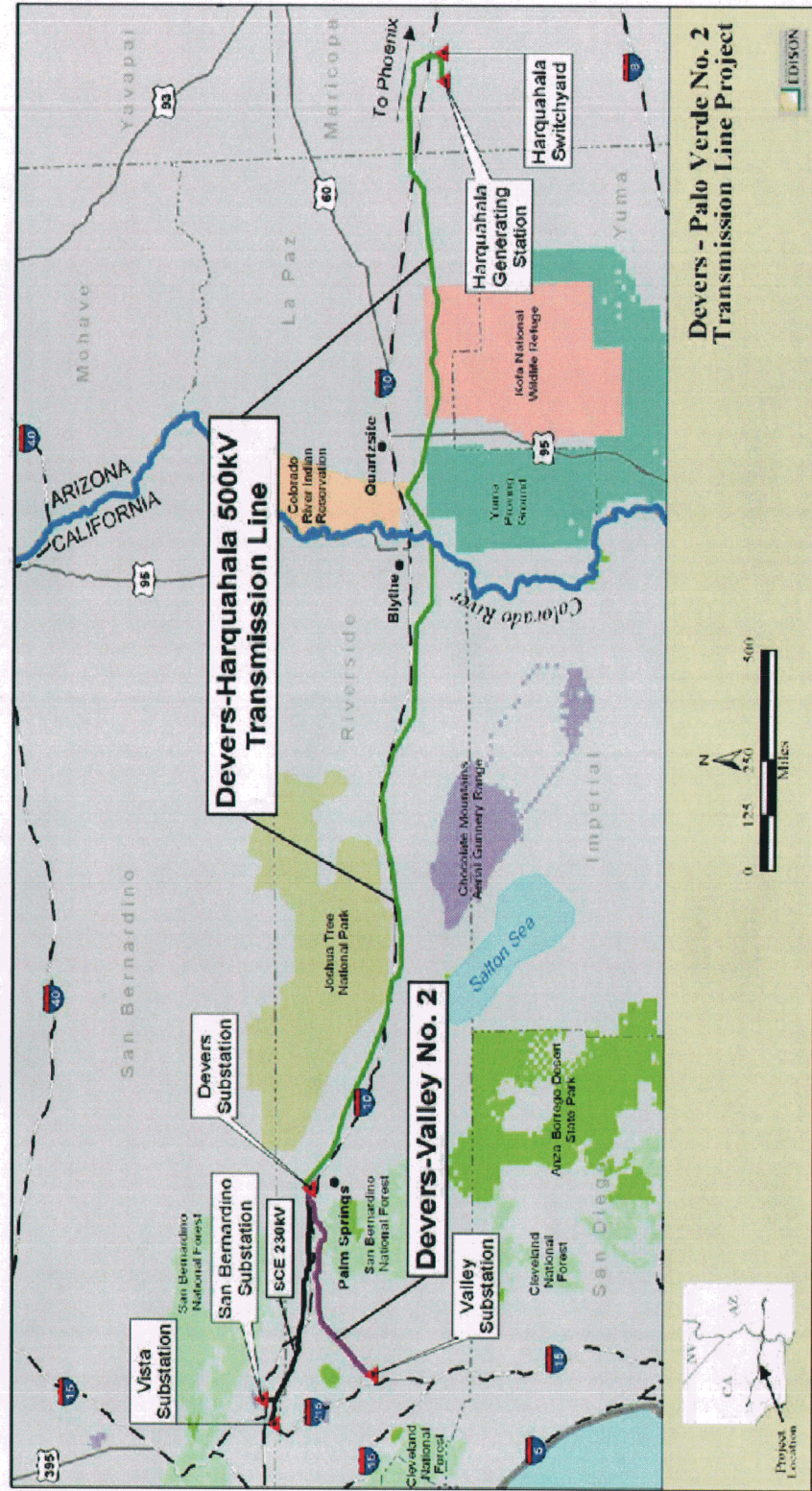


Exhibit 11 – Harcuvar Project Map

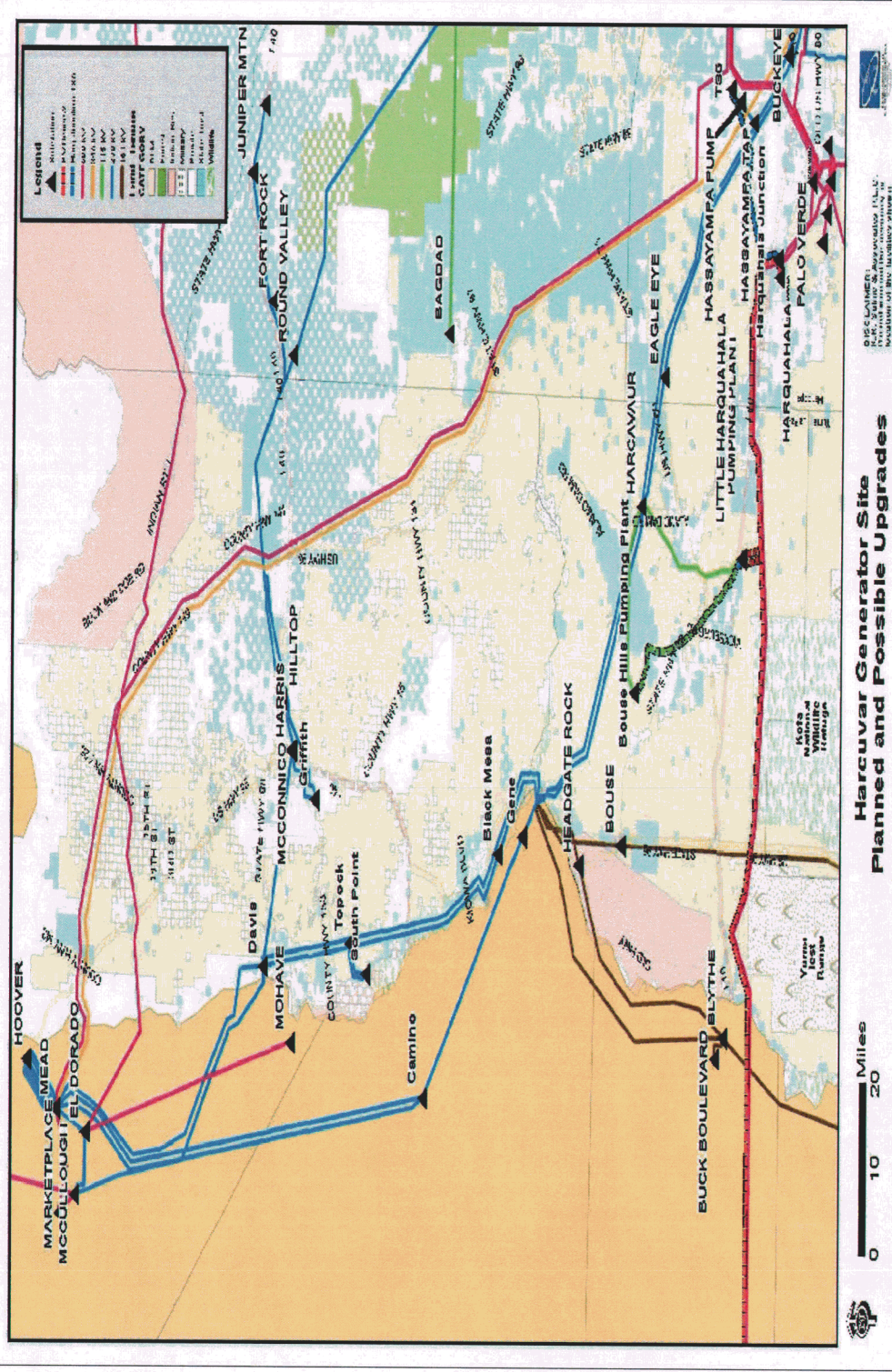


Exhibit 12 – Wellton-Mohawk Project Map

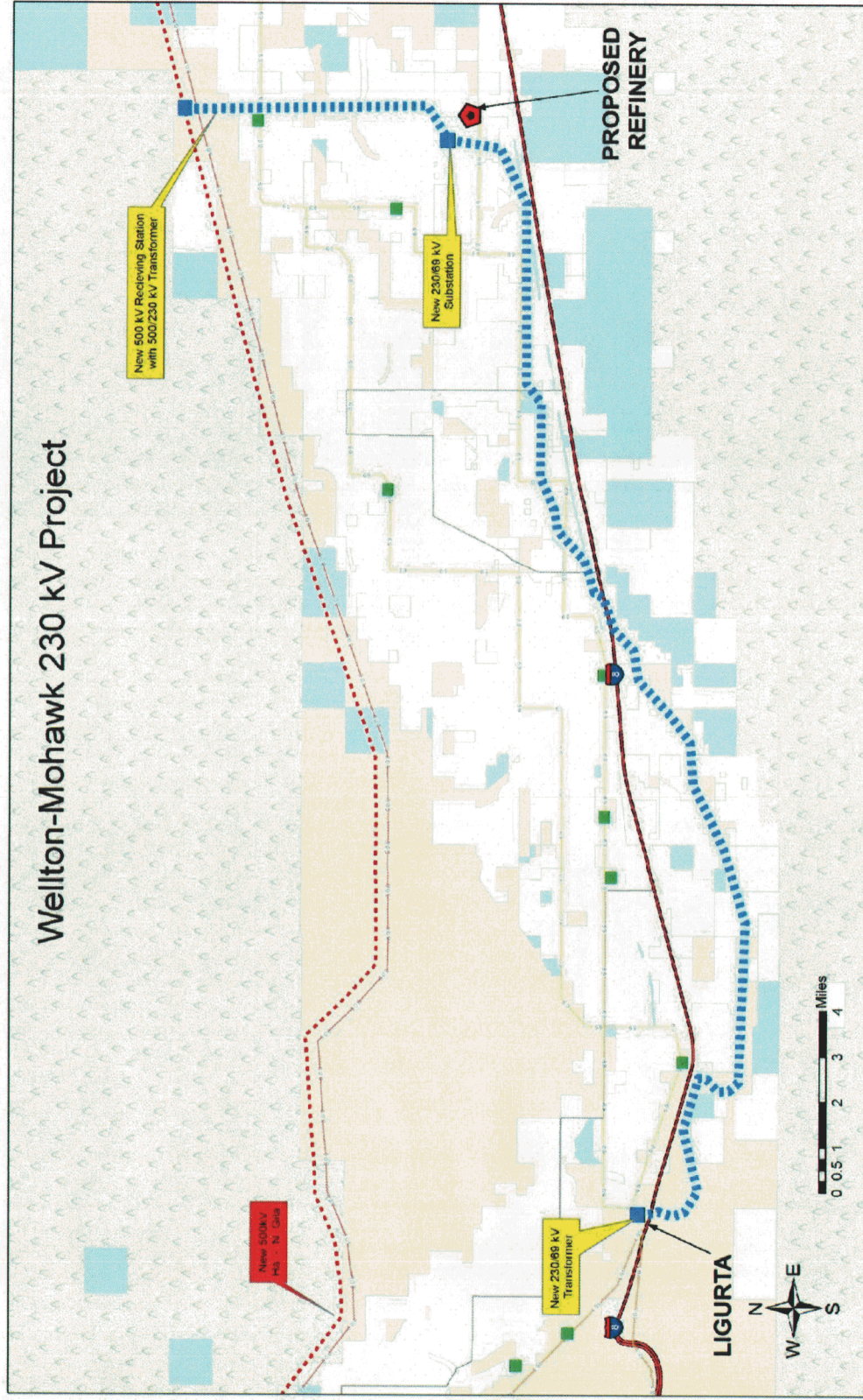


Exhibit 14 – Bowie Power Project Map

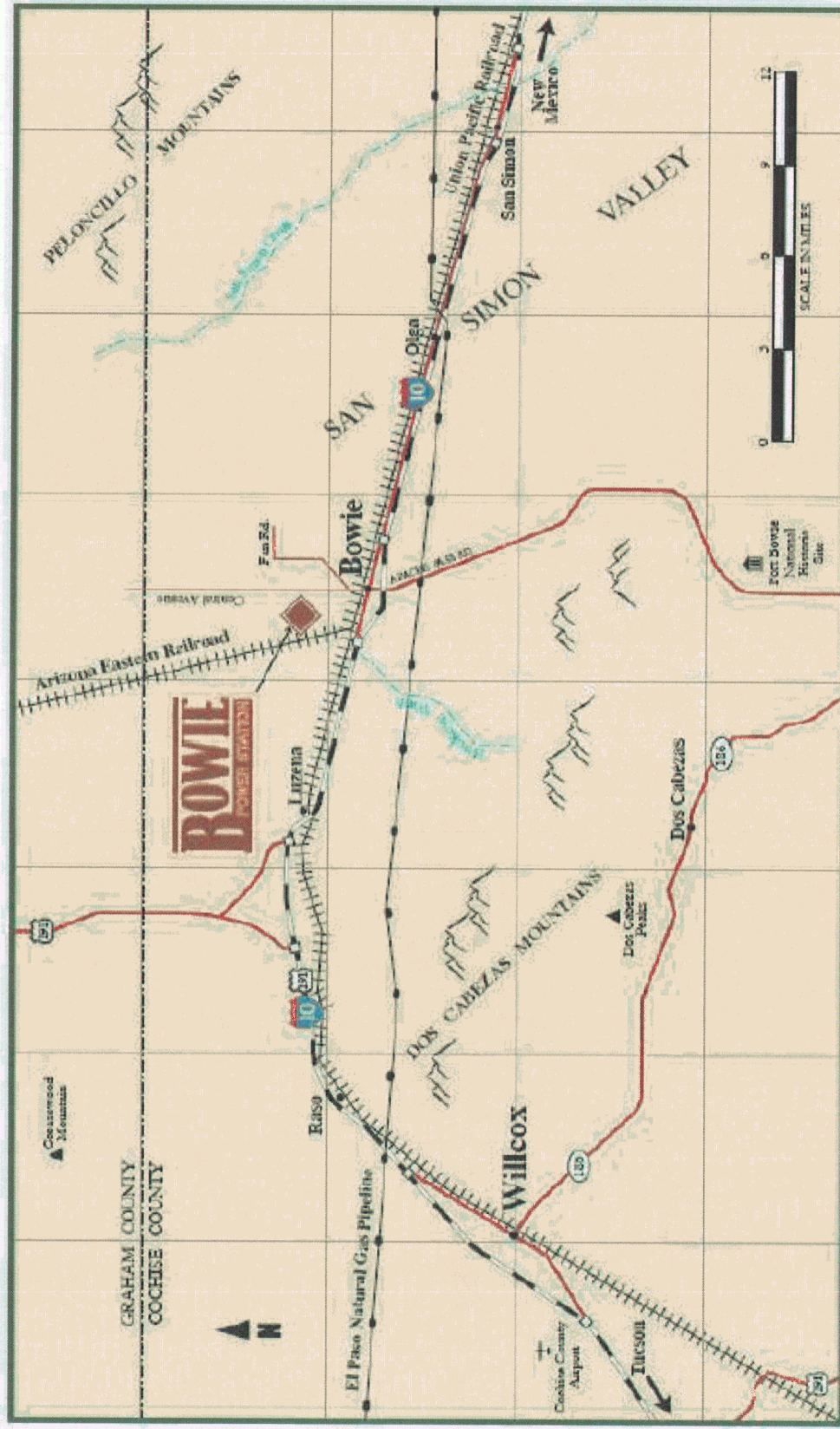


Exhibit 15 – SunZia Project Map

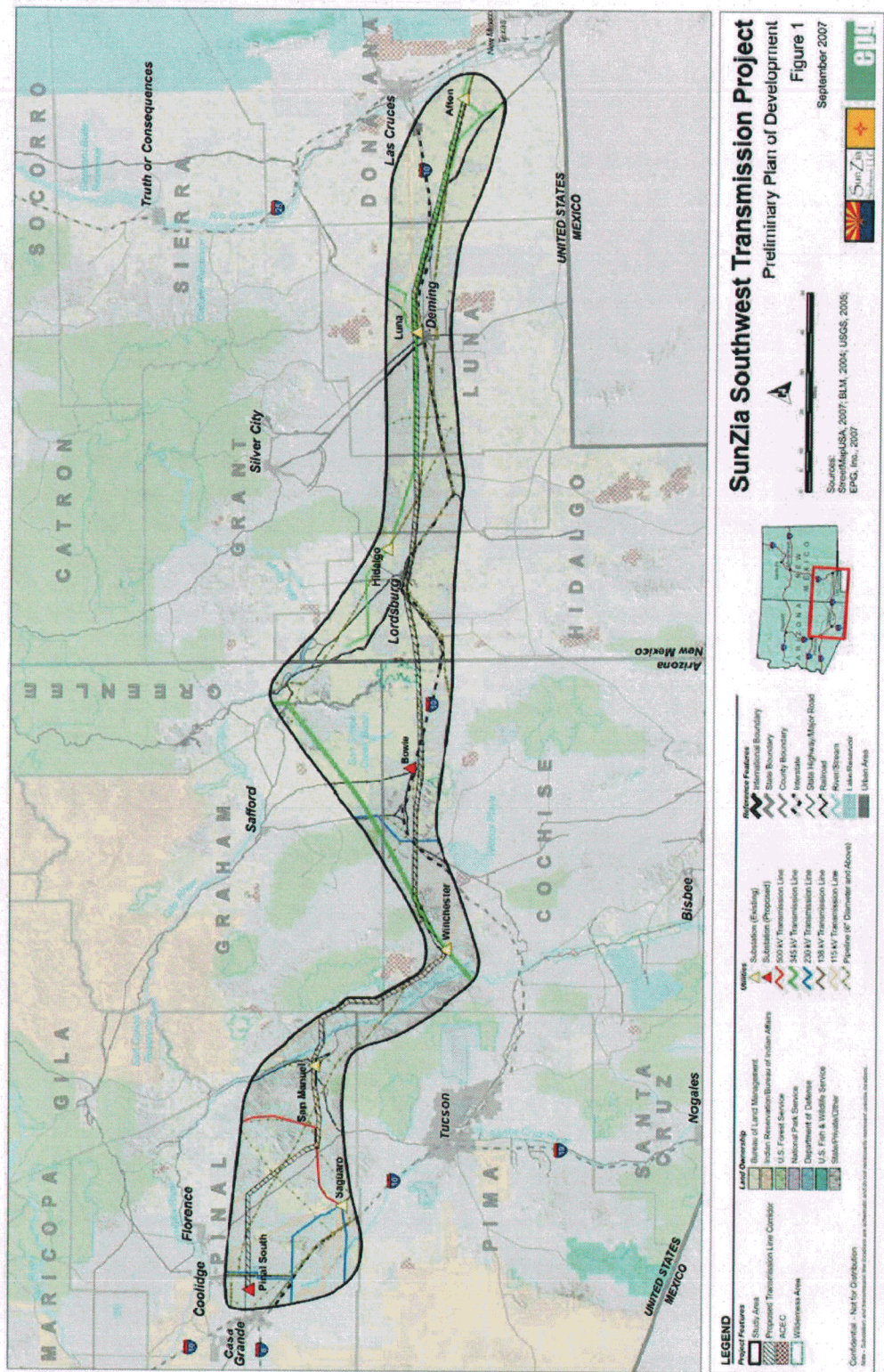


Exhibit 16 – High Plains Express Project Map



Exhibit 17 – TransWest Express Project Map

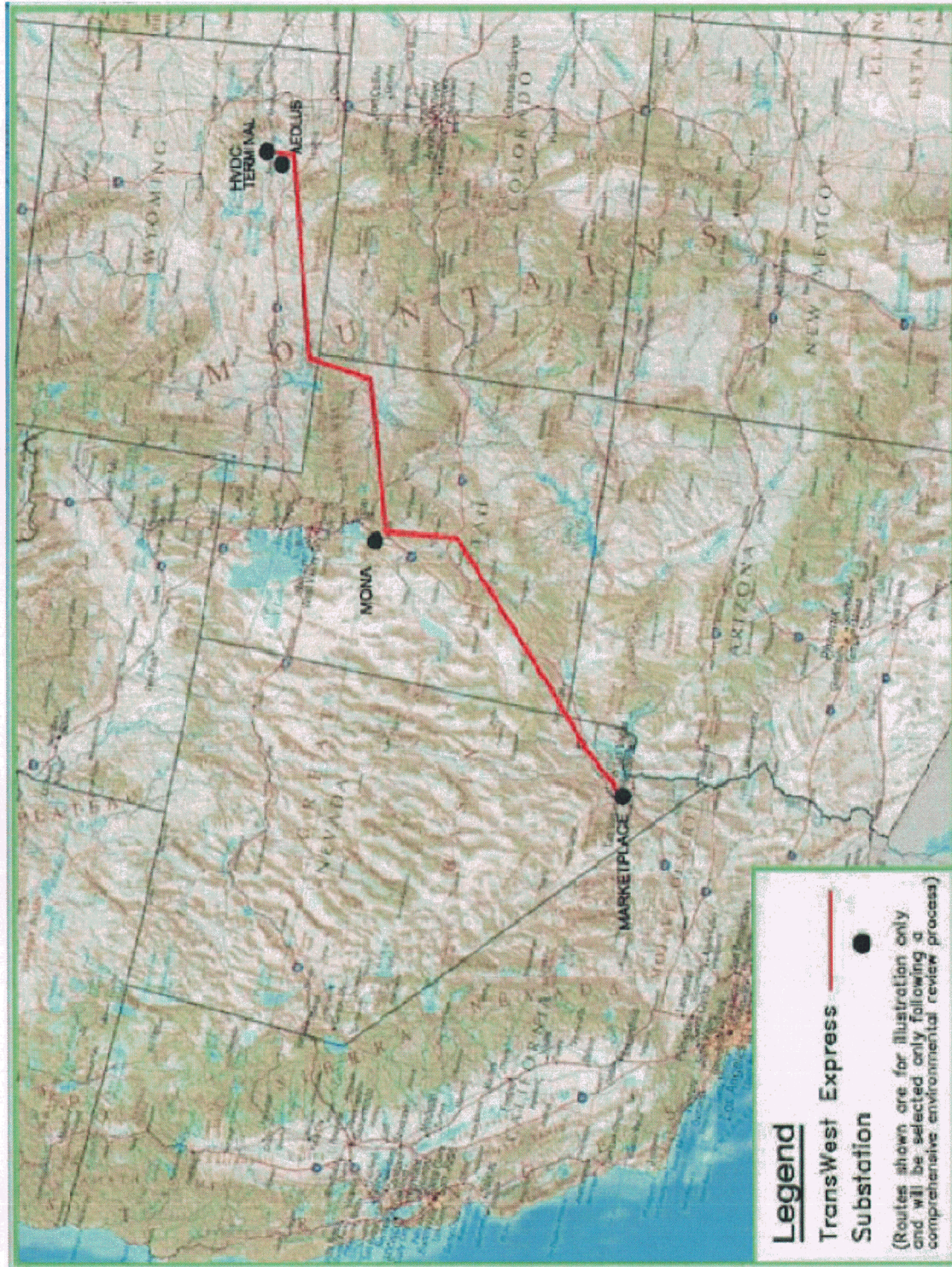


Exhibit 18 – Plan Changes Between Fourth and Fifth BTA

In-Service Date	Project	Voltage	Status
2006	Saddlebrooke Ranch	115 kV	Completed
2006	Vail -East Loop Line through Pantano and Los Reales Substations Phase 2	138 kV	Completed
2006	South – Duval CLEAR – Phase 2a – Green – Canoa Ranch line	138 kV	Completed
2007	Rudd-Palm Valley-TS4 230KV	230 kV	Completed
2007	Palm Valley 230/69KV Substation	230/69 kV	Completed
2007	Hackberry 230/69 Substation	230/69 kV	Completed
2007	Loop-In of Liberty to Orme into Rudd and new Orme to Anderson Line	230kV	Completed
2007	Browning-Dinosaur	230kV	Completed
2008	Tortolita - North Loop - Rancho Vistoso Project - Tortolita to North Loop Phase 1	138 kV	New Project - 2008
2008	Northeast 138 kV Static Var Compensator (SVC)	138 kV	New Project - 2008
2008	Loop existing West Ina Substation to Tucson Substation	138 kV	Changed In-Service date from 2007 to 2008
2008	Gateway - Sonoita 138KV transmission line	138 kV	New Project - TBD
2008	Golden Valley 230KV Project	230 kV	New Project - 2008
2008	Palo Verde - Pinal West	500kV	Due for Completion in 2008
2009	Valencia to CAP Black Mountain 115KV line	115 kV	Changed In-Service date from 2011 to 2009
2009	Saguaro to Naviska 115KV line	115 kV	Changed In-Service date from 2008 to 2009
2009	CAP 115 kV line loop-in to SWTC Sandario	115 kV	Changed In-Service date from 2012 to 2009
2009	Tortolita - North Loop - Rancho Vistoso Project - North Loop to Rancho Vistoso Phase 2	138 kV	New Project - 2009
2009	Western 115KV line loop-in to Pantano	115 kV	New Project - 2009
2009	Milligan loop-in of Saguaro-Casa Grande 230 kV line	230 kV	New Project - 2009
2009	Milligan 230/69 kV Substation	230/69 kV	New Project - 2009
2009	Sugarloaf(Second Knoll) loop-in of Coronado-Cholla 500 kV line	500 kV	Project Name Change
2010	Thornysdale to Rattlesnake 115KV line	115 kV	Changed In-Service date from 2012 to 2010
2010	Naviska to Thornysdale 115KV line	115 kV	Changed In-Service date from

Biennial Transmission Assessment for 2008-2017

Docket — E-00000D-07-0376

Exhibit 18

October 15, 2008

2010	Marana to Avra Valley 115kV Line Upgrade			2009 to 2010
2010	Tortolita - North Loop - Rancho Vistoso Project - Corridor Expansion Phase 3	115 kV		Changed In-Service date from 2015 to 2010
2010	Rancho Vistoso Substation to future Catalina Substation	138 kV		New Project - 2010
2010	Vail - Cienega Substations - Phase 1	138 kV		Changed In-Service date from 2009 to 2010
2010	North Loop Substation - Rancho Vistoso Substation 138kV tap for new Naranja Substation	138 kV		New Project - 2010
2010	DeMoss Petrie Substation - Tucson Substation 138 kV	138 kV		New Project - 2010
2010	Trilby Wash(TS1)- TS2-Palm Valley 230kV	230 kV		Changed In-Service date to 2010
2010	Sun Valley(TS5)- Trilby Wash(TS1) 230kV (with TS-2)	230 kV		Changed In-Service date from 2009 to 2010 (2011)
2010	Flagstaff 345/69kV interconnection	345/69 kV		Changed In-Service date from 2009 to 2010
2010	PV Hub-Sun Valley(TS5) 500kV	500 kV		Changed In-Service date from 2008 to 2010
2011	Sandario Tap to Three Points 115 kV Line Upgrade	115 kV		New Project - 2011
2011	Avra Valley to Sandario Tap 115kV Line Upgrade	115 kV		New Project - 2011
2011	Northeast - Snyder 138kV - Tap for Craycroft-Barril Substations	138 kV		New Project - 2011
2011	Sundance-Pinal South 230 kV	230 kV		New Project - 2011
2011	SE10 loop-in of Saguaro-Casa Grande 230 kV line	230 kV		New Project - 2011
2011	Desert Basin-Pinal South 230 kV	230 kV		New Project - 2011
2011	SE10 230/69 kV Sub	230/69 kV		New Project - 2011
2011	Pinal Central - SEV/RS22	230kV		New Project - 2011
2011	SEV/RS22 - Dinosaurs	230kV		New Project - 2011
2011	Pinal South Substation to Tortolita Substation	500 kV		New Project - 2011
2011	Pinal South-Browning	500 kV		New Project - 2011
2011	Palo-Verde - Devers #2 Line	500 kV		Changed In-Service from 2009 to 2011
2011	Pinal West - Pinal Central	500kV		2011
2012	Marana Tap to Marana 115 kV Line Upgrade	115 kV		New Project - 2012
2012	Tucson Substation -Downtown Substation	138 kV		New Project - 2012
2012	Irvington Substation - Tucson 138 kV - Tap for Kino Substation	138 kV		New Project - 2012
2012	RS24 - RS22/SEV Substations	230 kV		New Project - 2012

2012	RS17 - RS24		230 kV	New Project - 2012
2012	TS6 230/69 kV Substation		230/69 kV	New Project - 2012
2012	Series Capacitor Upgrade Project - Moenkopi-El Dorado 500kV		500 kV	Changed In-Service date from 2010 to 2012
2013	CS1 to Three Points 115kV line		115 kV	New Project - 2013
2013	South to Duval CLEAR-Phase 2b - Extend 138kV line from Canoa Ranch to future Duval		138 kV	New Project - 2013
2013	South Substation - Hartt Substation - Green valley Substation 138kV		138 kV	New Project - 2013
2013	Phase 1: Tortolita - Marana/Marana North Loop		138 kV	New Project - 2013
2013	Phase 1: Irvington - Corona Substation/Corona - South Substation		138 kV	New Project - 2013
2013	Loop existing Irvington to Vail Substation #2 line		138 kV	Changed In-Service date from 2011 to 2013
2013	Upgrade existing 115kV transmission line to Nogales		115 kV	Changed In-Service date from 2012 to 2013
2013	La Canada - Orange Grove - Rillito Substations 138kV		138 kV	New Project - 2013
2013	Extend 138kV line from Midvale through future Spencer to future San Joaquin		138 kV	Changed In-Service date from TBD to 2013
2013	Jojoba cut-in of TS4-Panda 230kV		230 kV	Changed In-Service date from 2011 to 2013
2013	Griffith - North Havasu 230 kV		230 kV	Changed In-Service date from TBD to 2008
2013	Future CS1 to Bicknell 230kV line		230 kV	New Project - 2013
2013	Avery 230/69 kV Substation		230/69 kV	New Project - 2013
2014	Tortolita Substation to Vail Substation - Phase 1		345 kV	New Project - 2014
2014	RS26 - Fountain Hill Substation		Under Review	
2016	Phase 2: Corona - SS N026 Substations/SS N026 - South Substations		115kV or 230kV	New Project - 2014
2016	Hartt Substation -SS N029 Substation 138 kV		138 kV	New Project - 2016
2017	Orange Grove Substation -SS N06 Substation		138 kV	New Project - 2016
2018	Phase 3: Corona - Swan Southlands Substations/Swan Southlands		138 kV	New Project - 2017
2019	Midvale Substation - SS N022 Substation - South Substation 138 kV		138 kV	New Project - 2018
2020	Vail Substation - SS N017 - Irvington Substation 138kV		138 kV	New Project - 2019
2020	Vail - SSN027 Substations - Phase 2		138 kV	New Project - 2020
2023	Cienega - SSN020 Substations - Phase 3		138 kV	New Project - 2020
2023	Marana - SSN01/SSN01 - North Loop - Phase 2		138 kV	New Project - 2023
2023			138 kV	New Project - 2023

2026	DeMoss Petrie Substation - SS N014 Substation - Northeast Substation 138kV	138 kV	New Project - 2026
2030	North Loop Substation - SS N04 Substation - DeMoss Petrie Substation	138 kV	New Project - 2030
TBD	Point on the Kearny - Hayden 115kV line to Future Hayden	115 kV	New Project - TBD
TBD	New Cienega Substation- Mountain View Substation	138 kV	New Project - TBD
TBD	Westwing -Pinnacle Peak	230 kV	New Project - TBD
TBD	Upgrade of Apache to Butterfield 230kV line	230 kV	New Project - TBD
TBD	SunValley-TS11-Buckeye 230 kV	230 kV	New Project - TBD
TBD	SunValley-TS10-TS11 230 kV	230 kV	New Project - TBD
TBD	Sun Valley-TS9 230kV line	230 kV	New Project - TBD
TBD	Silver King - Knoll - Future Hayden	230 kV	New Project - TBD
TBD	Silver King - Browning 230kV/Superior Tie	230 kV	New Project - TBD
TBD	Silver King - Browning	230 kV	New Project - TBD
TBD	Santa Rosa Substation - ED5 Substation	230 kV	New Project - TBD
TBD	RS17 Loop-in	230 kV	New Project - TBD
TBD	Rogers - Corbell	230 kV	New Project - TBD
TBD	Rogers - Browning	230 kV	New Project - TBD
TBD	Pinnacle Peak -Brandow	230 kV	New Project - TBD
TBD	Pinal South to a Future Substation 6 miles northeast of Pinal South #2	230 kV	New Project - TBD
TBD	Pinal South to a Future Substation 6 miles northeast of Pinal South #1	230 kV	New Project - TBD
TBD	North Gila-Yucca 230 kV	230 kV	New Project - TBD
TBD	Future Sloan Substation to Huachuca 230kV line Substation	230 kV	New Project - TBD
TBD	ED5 - Pinal South (Pinal Central)	230 kV	New Project - TBD
TBD	ED5 - Marana	230 kV	New Project - TBD
TBD	Dinosaur - RS21	230 kV	New Project - TBD
TBD	Tortolita Substation to Vail Substation - Phase 3	345 kV	New Project - TBD
TBD	Tortolita Substation to Vail Substation - Phase 2	345 kV	New Project - TBD
TBD	Future Gateway Substation to Comision Federale de Electricidad	345 kV	New Project - TBD
TBD	Hassayampa - Pinal West #2	500 kV	New Project - TBD

Exhibit 19 – Listing of Queue Interconnection Generation Projects

Interconnecting Utility	Maximum Output	Interconnection Location	In-Service Date	Technology
APS	Unit 1 - 700 Unit 2 - 700	Four Corners 500 Switchyard	1/1/2012	Coal
APS	128	Cholla/ Zeniff/Show Low Western 69 kV line and Cholla / Show Low Eastern 69 kV line	West = 8/17/2009 East = 10/1/2010	Coal
APS	22	Cholla/ Zeniff/Show Low Western 69 kV line	Q2 2008	Wind
APS	100	Existing Yucca 69 kV Substation	6/1/2008	Biomass
APS	Units 1-4 - 583 each (63 MW Net Increase per Unit)	Gila River 500 kV		Gas Combustion turbine
APS	270	Ashfork-Pollock 69 kV System and Seligman 230 kV to be studied	12/31/2008	Gas Combined Cycle
APS	125	Cholla / Show Low Eastern 69 kV line	11/1/2009	Wind
APS	100	Adams - Mural 115 kV line	12/31/2010	Wind
APS	102	Proposed Harquahala Junction (Delaney) Switchyard	10/1/10-12/1/2011	Wind
APS	102	Panda Liberty 230 kV or Panda Substation	10/1/10-12/1/2011	Solar
APS	400	North Gila Substation	12/31/2010	Solar
APS	1000	Moenkopi 500 kV	7/1/2010	Solar
APS	300	Cholla-Pinnacle Peak 345 kV line	11/1/2010	Wind
APS	400	Proposed Harquahala Junction (Delaney) Switchyard	7/31/2011- 12/31/2012	Wind
APS	800	Proposed Harquahala Junction (Delaney) Switchyard	1/1/2013- 12/31/2014	Solar
APS	500	Moenkopi -El dorado 500 kV line	7/1/2010	Solar
APS	250	North Gila Substation	Q4 2012	Wind
APS	500	Proposed Harquahala Junction (Delaney) Switchyard		Solar Thermal
APS	500	Proposed PV-NG2 500 kV line	6/30/2012	Solar
APS			6/30/2012	Solar
APS	280	Gila Bend 230 kV Substation	6/30/2013	Solar
APS			12/1/2011	Solar

SRP	150	CO-CH,CO-SK500 kV	3/1/2007	Wind
SRP	562	New 230 line, SEVP	9/1/2010	Natural Gas
TEP	430	Springerville, AZ	Q2 2004	Generator
UNSE	80	Dolan Springs Substation	9/12/2005	Wind
TEP	95	Between Coronado and Springerville Power Plants	12/31/2007	Wind
TEP	500	Greenlee-Vail 345 kV Line	N/A	Wind
TEP	700	Various	12/31/2010	Wind
TEP	700	Various	12/31/2010	Wind
TEP	250	South-Green Valley 138 kV Line	4Q 2012	Solar
WAPA	500	Tap on 345 kV Glen Canyon-Pinnacle Peak transmission system	12/31/2008	Wind Turbine Wind
WAPA	180	Griffith Switchyard 230 kV	6/1/2008	Gas Turbine Natural Gas
WAPA	300	Mead - Davis 230 kV Line	12/31/2009	Wind Turbine Wind
WAPA	65.1	Goldmine Tap Substation	12/31/2008	Wind Turbine Wind
WAPA	500	Peacock Substation	12/31/2008	Wind Turbine Wind

Exhibit 20 – Listing of Projects by In-Service Date

In-Service Date	Description	Voltage	Participants	Permitting/Status
2008	Hassayampa - Pinal West #1	500 kV	SRP, TEP, SWTC, ED2, ED3, ED4	CEC Approved – Case #124
2008	Griffith - North Havasu Transmission	230 kV, 69 kV	UNISOURCE	CEC Approved/Extended - Case #88
2008	Golden Valley 230 kV Project - McConico-Mercator Mill substations	230 kV	UNISOURCE	CEC Not Yet Filed
2008	Loop existing West Ina substation to Tucson substation	138 kV	TEP	CEC Approved - Case #62
2008	Northeast 138 kV Static Var Compensator (SVC)	138 kV	TEP	CEC Not Required
2008	Tortolita - North Loop - Rancho Vistoso Project - Tortolita to North Loop Phase 1	138 kV	TEP	CEC Not Yet Filed
2008	Apache/Hayden to San Manuel 115 kV line	115 kV	SWTC	CEC Not Yet Filed
2009	Sugarloaf loop-in of Coronado-Cholla 500 kV line	500 kV	APS, SRP	Not Required
2009	VV01 loop-in of Navajo-Westwing 500 kV line	500 kV	APS	Not Required
2009	Milligan loop-in of Saguaro-Casa Grande 230 kV line	230 kV	APS	Not Required
2009	Tortolita - North Loop - Rancho Vistoso Project - North Loop to Rancho Vistoso Phase 2	138 kV	TEP, SWTC	CEC Not Yet Filed
2009	Western 115 kV line loop-in to Pantano	115 kV	SWTC	CEC Not Required
2009	Saguaro to Naviska 115 kV line	115 kV	SWTC	CEC Not Yet Filed
2009	Valencia to CAP Black Mountain 115 kV line	115 kV	SWTC	CEC Not Yet Filed
2009	CAP 115 kV line loop-in to SWTC Sandario	115 kV	SWTC	CEC Not Required
2010	Palo Verde Hub-Sun Valley 500 kV line	500 kV	APS, SRP, CAWCD	CEC Approved – Decision #68063
2010	TS9-Pinnacle Peak 500 KV line	500 kV	APS, SRP	CEC Approved – Decision #69343
2010	White Hills substation	345 kV, 69 kV	UNISOURCE	CEC Not Required
2010	Bowie Power Project	345 kV	BOWIE	CEC Approved – Decisions #64626 and 69339
2010	345/69 kV Interconnection at Western's Flagstaff 345 kV bus	345 kV	APS	CEC Not Required

2010	TS9 - Raceway - Avery - TS6 - Pinnacle Peak 230 kV line	230 kV	APS	CEC Approved - Decision #69343
2010	Sun Valley -TS1 - 230 kV line	230 kV	APS	CEC Approved - Decision #67828
2010	Palm Valley - TS2 - TS1 - 230 kV line	230 kV	APS	CEC Approved - Decisions #66646 and #67828
2010	Rancho Vistoso substation to future Catalina substation	138 kV	TEP	CEC Not Required
2010	Vail - SS NO27 - Cienega - SS No22- Spanish Trail Project - Phase 1 - Vail - Cienega line	138 kV	TEP	CEC Not Yet Filed
2010	North Loop substation - Rancho Vistoso substation 138 kV tap for new Naranja substation	138 kV	TEP	CEC Not Yet Filed
2010	DeMoss Petrie substation - Tucson substation 138 kV	138 kV	TEP	CEC Not Yet Filed
2010	Tortolita - North Loop - Rancho Vistoso Project - Corridor Expansion Phase 3	138 kV	TEP	CEC Not Yet Filed
2010	Marana to Avra Valley 115 kV Line Upgrade	115 kV	SWTC	CEC Not Yet Filed
2010	Naviska to Thornydale 115 kV line	115 kV	SWTC	CEC Not Yet Filed
2010	Thornydale to Rattlesnake 115 kV line	115 kV	SWTC	CEC Not Yet Filed
2011	Pinal West-Southeast Valley/Browning	500 kV	SRP, TEP, SWTC,ED2,ED3, ED4	CEC Approved - Case #126
2011	Devers - Palo Verde #2	500 kV	SCE	CEC Denied - Case #130
2011	Pinal Central-Tortolita Substation	500 kV	TEP, SWTC	CEC Not Yet Filed
2011	Mazatzal loop-in of Cholla-Pinnacle Peak 345 kV line	345 kV	APS	Not Required
2011	SE10 loop-in of Saguaro-Casa Grande 230 kV line	230 kV	APS	Not Required
2011	Sundance - Pinal South 230 kV line	230 kV	APS, ED2	CEC Filed - Case #136
2011	Pinal South- Southeast Valley/RS22	230 kV	SRP, TEP, SWTC,ED2,ED3, ED4	CEC Approved - Decisions #68093 and #69291
2011	Desert Basin - Pinal South 230 kV	230 kV	APS, SRP	CEC Approved - Decisions #68093, #68291, #69183 and #69647
2011	Northeast - Snyder 138 kV - Tap for Craycroft-Barril substations	138 kV	TEP	CEC Not Required

2011	Avra Valley to Sandario Tap 115 kV Line Upgrade	115 kV	SWTC	CEC Not Yet Filed
2011	Sandario Tap to Three Points 115 kV Line Upgrade	115 kV	SWTC	CEC Not Yet Filed
2012	Sun Valley - TS9 500 kV line	500 kV	APS, SRP, CAWCD	To be filed in 2008
2012	Palo Verde Hub - North Gila 500 kV #2 line	500 kV	APS, SRP, IID, WMIDD	CEC Approved - Decision #70127
2012	Series Capacitor Upgrade Project - Moenkopi-Eldorado 500 kV	500 kV	SCE, APS	CEC Not Required
2012	North Gila - TS8 230 kV line	230 kV	APS	To be Filed in 2008
2012	RS17 - RS24	230 kV	SRP	CEC Not Yet Filed
2012	RS24 - RS22/SEV substations	230 kV	SRP	CEC Not Yet Filed
2012	TS9 - Raceway - Avery - TS6 - Pinnacle Peak 230 kV line Project - Avery Substation	230 kV	APS	CEC Approved - Decision #69343
2012	Irvington substation - Tucson 138 kV - Tap for Kino substation	138 kV	TEP	CEC Not Yet Filed
2012	Tucson substation -Downtown substation	138 kV	TEP	CEC Not Yet Filed
2012	Marana Tap to Marana 115 kV Line Upgrade	115 kV	SWTC	CEC Not Required
2013	SunZia Project	500 kV	SWPG, SRP, TEP, ECP, Shell	CEC Not Yet Filed
2013	Jojoba loop-in of TS4-Panda 230 kV line	230 kV	APS	CEC Approved - Decision #62960
2013	CS1 to Bicknell 230 kV line	230 kV	SWTC	CEC Not Yet Filed
2013	TS9 - Raceway - Avery - TS6 - Pinnacle Peak 230 kV line Project - TS6 Substation	230 kV	APS	CEC Approved - Decision #69343
2013	Extend 138 kV line from Midvale through future Spencer to future San Joaquin	138 kV	TEP	CEC Not Yet Filed
2013	South to Duval CLEAR-Phase 2b - Extend 138 kV line from Canoa Ranch to future Duval	138 kV	TEP	CEC Approved - Case #84
2013	Loop existing Irvington station to Vail substation #2 line	138 kV	TEP	CEC Not Yet Filed
2013	Tortolita/Marana - North Loop Project -Phase 1 - Tortolita - Marana/Marana North Loop	138 kV	TEP	CEC Not Yet Filed
2013	Irvington - South Project - Phase 1 - Irvington - Corona - South line	138 kV	TEP	CEC Not Yet Filed
2013	La Canada - Orange Grove - Rillito substations 138 kV South substation - Hartt substation - Green valley substation 138 kV	138 kV	TEP	CEC Not Yet Filed
2013	Upgrade existing 115 kV transmission line to Nogales	138 kV	TEP	CEC Not Yet Filed
2013			UNISOURCE	CEC Not Yet Filed

2013	CS1 to Three Points 115 kV line	115 kV	SWTC	CEC Not Yet Filed
2014	Tortolita substation to Vail substation - Phase 1	345 kV	TEP	CEC Not Yet Filed
2014	RS26 - Fountain Hill substation	115 kV, 230 kV or 345 kV	SRP	CEC Not Yet Filed
2016	Irvington - South Project - Phase 2 - Corona - SS N026 - South lines	138 kV	TEP	CEC Not Yet Filed
2016	Hartt substation -SS N029 substation 138 kV	138 kV	TEP	CEC Not Yet Filed
2017	Orange Grove substation -SS N06 substation	138 kV	TEP	CEC Not Yet Filed
2018	Irvington - South Project -Phase 3 - Corona - Swan Southlands and Swan Southlands - SS NO 26 lines	138 kV	TEP	CEC Not Yet Filed
2019	Midvale substation - SS N022 substation - South substation 138 kV	138 kV	TEP	CEC Not Yet Filed
2020	Vail - SS N027 - Cienega - SS No22- Spanish Trail Project - Phase 2 - Vail - SSN027 line	138 kV	TEP	CEC Not Yet Filed
2020	Vail substation - SS N017 - Irvington substation 138 kV	138 kV	TEP	CEC Not Yet Filed
2023	Vail - SS N027 - Cienega - SS No22- Spanish Trail Project - Phase 3 - Cienega - SSN020 line	138 kV	TEP	CEC Not Yet Filed
2023	Tortolita/Marana - North Loop Project -Phase 2 - Marana - SSN01/SSN01 -North Loop	138 kV	TEP	CEC Not Yet Filed
2026	DeMoss Petrie substation - SS N014 substation - Northeast substation 138 kV	138 kV	TEP	CEC Not Yet Filed
2030	North Loop substation - SS N04 substation - DeMoss Petrie substation	138 kV	TEP	CEC Not Yet Filed
TBD	Palo Verde - Saguaro 500 kV line	500 kV	CATS Sub-regional Planning Group	CEC Approved - Decision#46802
TBD	Arlington Power Plant	500 kV	Dynegy Arlington Valley	CEC Approved - Decision #64357
TBD	Hassayampa - Pinal West #2	500 kV	SRP, TEP, SWTC,ED2,ED3, ED4	CEC Approved - Case #124
TBD	Tortolita substation to Winchester substation	500 kV	TEP	CEC Approved - Case #23
TBD	Gateway 345/115 kV or 345/138 kV substations	345 kV, 138 kV, 115 kV	UNISOURCE	CEC Approved - Case #111
TBD	Greenlee switching station through Hidalgo to Luna	345 kV	ELPE,PNM, TXNMPC	CEC Approved - Case #21
TBD	Tortolita substation to Vail substation - Phase 2	345 kV	TEP	CEC Not Yet Filed

TBD	Tortolita substation to Vail substation - Phase 3	345 kV	TEP	CEC Not Yet Filed
TBD	Winchester substation to Vail substation - 2nd circuit	345 kV	TEP	CEC Not Yet Filed
TBD	Vail substation to South substation - 2nd circuit	345 kV	TEP	CEC Not Yet Filed
TBD	Springerville substation to Greenlee substation - 2nd circuit	345 kV	TEP	CEC Not Yet Filed
TBD	Tortolita substation to South substation	345 kV	TEP	CEC Approved - Case #50
TBD	Westwing substation to South substation - 2nd circuit	345 kV	TEP	CEC Approved - Case #15
TBD	Interconnection line-South substation to future Gateway sub	345 kV	TEP, UNISOURCE	CEC Approved - Case #111
TBD	Future Gateway substation to Comision Federale de Electricidad	345 kV	TEP	CEC Approved - Case #111
TBD	Sun Valley - TS11 - Buckeye 230 kV line	230 kV	APS	CEC Not Yet Filed
TBD	Sun Valley - TS10 - TS11 230 kV line	230 kV	APS	CEC Not Yet Filed
TBD	Sun Valley - TS9 230 kV line	230 kV	APS	To be filed in 2008
TBD	North Gila - Yucca 230 kV line	230 kV	APS	CEC Not Yet Filed
TBD	Yucca - TS8 230 kV line	230 kV	APS	CEC Not Yet Filed
TBD	Westwing -El Sol 230 kV line	230 kV	APS	CEC Approved - Docket#U-1345
TBD	Westwing - Raceway 230 kV line	230 kV	APS	CEC Approved - Decision#64473
TBD	RS17 Loop-in	230 kV	SRP	CEC Approved - Decisions #59791 and #60099
TBD	Dinosaur - RS21	230 kV	SRP	CEC Not Yet Filed
TBD	Rogers - Browning	230 kV	SRP	CEC Not Yet Filed
TBD	Silver King - Browning	230 kV	SRP	CEC Approved - Case #20
TBD	Silver King - Browning 230 kV/Superior Tie	230 kV	SRP	CEC Not Yet Filed
TBD	Westwing -Pinnacle Peak	230 kV	APS, SRP	CEC Approved - Decision #64473
TBD	Sun Valley -TS1 - 230 kV line #2	230 kV	APS	CEC Approved - Decision #67828
TBD	Palm Valley - TS2 - TS1 - 230 kV line #2	230 kV	APS	CEC Approved - Decisions #66646 and #67828

TBD	Pinnacle Peak - Brandom	230 kV	SRP	CEC Approved - Case #69
TBD	Rogers - Corbell	230 kV	SRP	CEC Not Required
TBD	Silver King - Knoll - Future Hayden	230 kV	SRP	CEC Not Yet Filed
TBD	Santa Rosa substation - ED5 substation	230 kV	SCWPDA, SPPR	CEC Not Yet Filed
TBD	ED5 - Marana	230 kV	SCWPDA, SPPR	CEC Not Yet Filed
TBD	Pinal Central (Pinal South) to a Future substation 6 miles northeast of Pinal Central #1	230 kV	SCWPDA, SPPR	CEC Not Yet Filed
TBD	Pinal Central (Pinal South) to a Future substation 6 miles northeast of Pinal Central #2	230 kV	SCWPDA, SPPR	CEC Not Yet Filed
TBD	Upgrade of Apache to Butterfield 230 kV line	230 kV	SWTC	CEC Not Yet Filed
TBD	Future Sloan substation to Huachuca 230 kV line	230 kV	SWTC	CEC Not Yet Filed
TBD	ED5 - Pinal South (Pinal Central)	230 kV	SCWPDA, SPPR	CEC Not Yet Filed
TBD	Valencia 115 kV substation expansion	138 kV, 115 kV	UNISOURCE	CEC Approved - Case #111
TBD	Irvington substation to East Loop substation - Phase 3	138 kV	TEP	CEC Approved - Case #66
TBD	Vail - East Loop - Phase 3 - Third 138 kV line from Vail to East Loop	138 kV	TEP	CEC Approved - Case #8
TBD	Vail - East Loop - Phase 4 - Harrison Tap of Roberts-East Loop Line	138 kV	TEP	CEC Approved - Case #8
TBD	East Loop substation to Northeast substation	138 kV	TEP	CEC Approved - Case #47
TBD	Tortolita substation - Rillito substation	138 kV	TEP	CEC Not Yet Filed
TBD	New Cienega substation- Mountain View substation	138 kV	TEP	CEC Not Yet Filed
TBD	Gateway - Sonoita 138 kV transmission line	138 kV	UNISOURCE	CEC Not Yet Filed
TBD	Nogales transmission line #2	115 kV, 138 kV	UNISOURCE	CEC Approved - Case #111
TBD	Point on the Kearny - Hayden 115 kV line to Future Hayden	115 kV	SRP	CEC Not Yet Filed

Exhibit 21 – Listing of Projects by Voltage Class

Voltage	Description	In-Service Date	Participants	Permitting/Status
500 kV	Hassayampa - Pinal West #1	2008	SRP, TEP, SWTC, ED2, ED3, ED4	CEC Approved – Case #124
500 kV	Pinal West-Southeast Valley/Browning	2011	SRP, TEP, SWTC, ED2, ED3, ED4	CEC Approved - Case #126
500 kV	Devers - Palo Verde #2	2011	SCE	CEC Denied - Case #130
500 kV	Pinal Central-Tortolita Substation	2011	TEP, SWTC	CEC Not Yet Filed
500 kV	Sun Valley - TS9 500 kV line	2012	APS, SRP, CAWCD	To be filed in 2008
500 kV	Palo Verde Hub - North Gila 500 kV #2 line	2012	APS, SRP, IID, WMIDD	CEC Approved – Decision #70127
500 kV	Series Capacitor Upgrade Project - Moenkopi-Eldorado 500 kV	2012	SCE, APS	CEC Not Required
500 kV	SunZia Project	2013	SWPG, SRP, TEP, ECP, Shell	CEC Not Yet Filed
500 kV	Palo Verde - Saguaro 500 kV line	TBD	CATS Sub-regional Planning Group	CEC Approved – Decision #46802
500 kV	Arlington Power Plant	TBD	Dynegy Arlington Valley	CEC Approved – Decision #64357
500 kV	Hassayampa - Pinal West #2	TBD	SRP, TEP, SWTC, ED2, ED3, ED4	CEC Approved – Case #124
500 kV	Tortolita substation to Winchester substation	TBD	TEP	CEC Approved - Case #23
500 kV	Sugarloaf loop-in of Coronado-Cholla 500 kV line	2009	APS, SRP	Not Required
500 kV	VV01 loop-in of Navajo-Westwing 500 kV line	2009	APS	Not Required
500 kV	Palo Verde Hub-Sun Valley 500 kV line	2010	APS, SRP, CAWCD	CEC Approved – Decision #68063
500 kV	TS9-Pinnacle Peak 500 kV line	2010	APS, SRP	CEC Approved – Decision #69343
500 kV	Hassayampa – Jojoba 500 kV line	TBD	GBPP	CEC Approved – Case #119 – Extension Request Pending

500 kV	Gila Bend Power Plant – Tap Gila River – Jojoba line	TBD	GBPP	CEC Approved – Case #109 – Extension Expires 4/2011
345 kV, 138 kV, 115 kV	Gateway 345/115 kV or 345/138 kV substations	TBD	UNISOURCE	CEC Approved – Case #111
345 kV, 69 kV	White Hills substation	2010	UNISOURCE	CEC Not Required
345 kV	Bowie Power Project	2010	BOWIE	CEC Approved – Decisions #64626 and 69339
345 kV	Mazatzal loop-in of Cholla-Pinnacle Peak 345 kV line	2011	APS	Not Required
345 kV	Tortolita substation to Vail substation – Phase 1	2014	TEP	CEC Not Yet Filed
345 kV	Greenlee switching station through Hidalgo to Luna	TBD	ELPE, PNM, TXNMP	CEC Approved – Case #21
345 kV	Tortolita substation to Vail substation – Phase 2	TBD	TEP	CEC Not Yet Filed
345 kV	Tortolita substation to Vail substation – Phase 3	TBD	TEP	CEC Not Yet Filed
345 kV	Winchester substation to Vail substation – 2nd circuit	TBD	TEP	CEC Not Yet Filed
345 kV	Vail substation to South substation – 2nd circuit	TBD	TEP	CEC Not Required
345 kV	Springerville substation to Greenlee substation – 2nd circuit	TBD	TEP	CEC Not Yet Filed
345 kV	Tortolita substation to South substation	TBD	TEP	CEC Approved – Case #50
345 kV	Westwing substation to South substation – 2nd circuit	TBD	TEP	CEC Approved – Case #15
345 kV	Interconnection line-South substation to future Gateway sub	TBD	TEP, UNISOURCE	CEC Approved – Case #111
345 kV	Future Gateway substation to Comision Federale de Electricidad	TBD	TEP	CEC Approved – Case #111
345 kV	345/69 kV Interconnection at Western's Flagstaff	2010	APS	Not Required
230 kV, 69 kV	Griffith – North Havasu Transmission	2008	UNISOURCE	CEC Approved/Extended – Case #88
230 kV	Golden Valley 230 kV Project – McConico-Mercator Mill substations	2008	UNISOURCE	CEC Not Yet Filed
230 kV	TS9 – Raceway – Avery – TS6 – Pinnacle Peak 230 kV	2010	APS	CEC Approved –

230 kV	line				Decision #69343
	SE10 loop-in of Saguaro-Casa Grande 230 kV line	2011	APS		Not Required
230 kV	Sundance - Pinal South 230 kV line	2011	APS, ED2		CEC Filed - Case #136
230 kV	Pinal South- Southeast Valley/RS22	2011	SRP, TEP, SWTC, ED2, ED3, ED4		CEC Approved - Decisions #68093 and #69291
230 kV	North Gila - TS8 230 kV line	2012	APS		To be Filed in 2008
230 kV	RS17 - RS24	2012	SRP		CEC Not Yet Filed
230 kV	RS24 - RS22/SEV substations	2012	SRP		CEC Not Yet Filed
230 kV	TS9 - Raceway - Avery - TS6 - Pinnacle Peak 230 kV line Project - Avery Substation	2012	APS		CEC Approved - Decision #69343
230 kV	Jojoba loop-in of TS4-Panda 230 kV line	2013	APS		CEC Approved - Decision #62960
230 kV	CS1 to Bicknell 230 kV line	2013	SWTC		CEC Not Yet Filed
230 kV	TS9 - Raceway - Avery - TS6 - Pinnacle Peak 230 kV line Project - TS6 substation	2013	APS		CEC Approved - Decision #69343
230 kV	Sun Valley - TS11 - Buckeye 230 kV line	TBD	APS		CEC Not Yet Filed
230 kV	Sun Valley - TS10 - TS11 230 kV line	TBD	APS		CEC Not Yet Filed
230 kV	Sun Valley - TS9 230 kV line	TBD	APS		To be filed in 2008
230 kV	North Gila - Yucca 230 kV line	TBD	APS		CEC Not Yet Filed
230 kV	Yucca - TS8 230 kV line	TBD	APS		CEC Not Yet Filed
230 kV	Westwing -El Sol 230 kV line	TBD	APS		CEC Approved - Docket#U-1345
230 kV	Westwing - Raceway 230 kV line	TBD	APS		CEC Approved - Decision#64473
230 kV	RS17 Loop-in	TBD	SRP		CEC Approved - Decisions #59791 and #60099
230 kV	Dinosaur - RS21	TBD	SRP		CEC Not Yet Filed
230 kV	Rogers - Browning	TBD	SRP		CEC Not Yet Filed
230 kV	Silver King - Browning	TBD	SRP		CEC Approved - Case #20
230 kV	Silver King - Browning 230 kV/Superior Tie	TBD	SRP		CEC Not Yet Filed
230 kV	Westwing -Pinnacle Peak	TBD	APS, SRP		CEC Approved - Decision #64473

230 kV	Pinnacle Peak -Brandow					CEC Approved - Case #69
230 kV	Rogers - Corbell			TBD	SRP	CEC Not Required
230 kV	Silver King - Knoll - Future Hayden			TBD	SRP	CEC Not Yet Filed
230 kV	Santa Rosa substation - ED5 substation			TBD	SCWPDA, SPPR	CEC Not Yet Filed
230 kV	ED5 - Marana			TBD	SCWPDA, SPPR	CEC Not Yet Filed
230 kV	Pinal Central (Pinal South) to a Future substation 6 miles northeast of Pinal Central #1			TBD	SCWPDA, SPPR	CEC Not Yet Filed
230 kV	Pinal Central (Pinal South) to a Future substation 6 miles northeast of Pinal Central #2			TBD	SCWPDA, SPPR	CEC Not Yet Filed
230 kV	Upgrade of Apache to Butterfield 230 kV line			TBD	SWTC	CEC Not Yet Filed
230 kV	Future Sloan substation to Huachuca 230 kV line			TBD	SWTC	CEC Not Yet Filed
230 kV	Milligan loop-in of Saguaro-Casa Grande 230 kV line			2009	APS	CEC Not Required
230 kV	Sun Valley -TS1 - 230 kV line			2010	APS	CEC Approved - Decision #67828
230 kV	Palm Valley - TS2 - TS1 - 230 kV line			2010	APS	CEC Approved - Decisions #66646 and #67828
230 kV	Sun Valley -TS1 - 230 kV line #2			TBD	APS	CEC Approved - Decision #67828
230 kV	Palm Valley - TS2 - TS1 - 230 kV line #2			TBD	APS	CEC Approved - Decisions #66646 and #67828
230 kV	Desert Basin - Pinal South 230 kV			2011	APS, SRP	CEC Approved - Decisions #68093, #68291, #69183 and #69647
230 kV	ED5 - Pinal South (Pinal Central)			TBD	SCWPDA, SPPR	CEC Not Yet Filed
138 kV, 115 kV	Valencia 115 kV substation expansion			TBD	UNISOURCE	CEC Approved - Case #111
138 kV	Loop existing West Ina substation to Tucson substation			2008	TEP	CEC Approved - Case #62
138 kV	Northeast 138 kV Static Var Compensator (SVC)			2008	TEP	CEC Not Required
138 kV	Tortolita - North Loop - Rancho Vistoso Project - Tortolita to North Loop Phase 1			2008	TEP	CEC Not Yet Filed
138 kV	Tortolita - North Loop - Rancho Vistoso Project -			2009	TEP	CEC Not Yet Filed

138 kV	North Loop to Rancho Vistoso Phase 2			
	Rancho Vistoso substation to future Catalina substation	2010	TEP	CEC Not Required
138 kV	Vail - SS NO27 - Cienega - SS No22- Spanish Trail Project - Phase 1 - Vail - Cienega line	2010	TEP	CEC Not Yet Filed
138 kV	North Loop substation - Rancho Vistoso substation 138 kV tap for new Naranja substation	2010	TEP	CEC Not Yet Filed
138 kV	DeMoss Petrie substation - Tucson substation 138 kV	2010	TEP	CEC Not Yet Filed
138 kV	Tortolita - North Loop - Rancho Vistoso Project - Corridor Expansion Phase 3	2010	TEP	CEC Not Yet Filed
138 kV	Northeast - Snyder 138 kV - Tap for Craycroft-Barril substations	2011	TEP	CEC Not Required
138 kV	Irvington substation - Tucson 138 kV - Tap for Kino substation	2012	TEP	CEC Not Yet Filed
138 kV	Tucson substation -Downtown substation	2012	TEP	CEC Not Yet Filed
138 kV	Extend 138 kV line from Midvale through future Spencer to future San Joaquin	2013	TEP	CEC Not Yet Filed
138 kV	South to Duval CLEAR-Phase 2b - Extend 138 kV line from Canoa Ranch to future Duval	2013	TEP	CEC Approved - Case #84
138 kV	Loop existing Irvington station to Vail substation #2 line	2013	TEP	CEC Not Yet Filed
138 kV	Tortolita/Marana - North Loop Project -Phase 1 - Tortolita - Marana/Marana North Loop	2013	TEP	CEC Not Yet Filed
138 kV	Irvington - South Project - Phase 1 - Irvington - Corona - South line	2013	TEP	CEC Not Yet Filed
138 kV	La Canada - Orange Grove - Rillito substations 138 kV	2013	TEP	CEC Not Yet Filed
138 kV	South substation - Hartt substation - Green valley substation 138 kV	2013	TEP	CEC Not Yet Filed
138 kV	Upgrade existing 115 kV transmission line to Nogales	2013	UNISOURCE	CEC Not Yet Filed
138 kV	Irvington - South Project - Phase 2 - Corona - SS N026 - South lines	2016	TEP	CEC Not Yet Filed
138 kV	Hartt substation -SS N029 substation 138 kV	2016	TEP	CEC Not Yet Filed
138 kV	Orange Grove substation -SS N06 substation	2017	TEP	CEC Not Yet Filed
138 kV	Irvington - South Project -Phase 3 - Corona - Swan	2018	TEP	CEC Not Yet Filed

	Southlands and Swan Southlands - SS NO 26 lines			
138 kV	Midvale substation - SS N022 substation - South substation 138 kV	2019	TEP	CEC Not Yet Filed
138 kV	Vail - SS N027 - Cienega - SS N022- Spanish Trail Project - Phase 2 - Vail - SSN027 line	2020	TEP	CEC Not Yet Filed
138 kV	Vail substation - SS N017 - Irvington substation 138 kV	2020	TEP	CEC Not Yet Filed
138 kV	Vail - SS N027 - Cienega - SS N022- Spanish Trail Project - Phase 3 - Cienega - SSN020 line	2023	TEP	CEC Not Yet Filed
138 kV	Tortolita/Marana - North Loop Project -Phase 2 - Marana - SSN01/SSN01 -North Loop	2023	TEP	CEC Not Yet Filed
138 kV	DeMoss Petrie substation - SS N014 substation - Northeast substation 138 kV	2026	TEP	CEC Not Yet Filed
138 kV	North Loop substation - SS N04 substation - DeMoss Petrie substation	2030	TEP	CEC Not Yet Filed
138 kV	Irvington substation to East Loop substation - Phase 3	TBD	TEP	CEC Approved - Case #66
138 kV	Vail - East Loop - Phase 3 - Third 138 kV line from Vail to East Loop	TBD	TEP	CEC Approved - Case #8
138 kV	Vail - East Loop - Phase 4 - Harrison Tap of Roberts-East Loop Line	TBD	TEP	CEC Approved - Case #8
138 kV	East Loop substation to Northeast substation	TBD	TEP	CEC Approved - Case #47
138 kV	Tortolita substation -Rillito substation	TBD	TEP	CEC Not Yet Filed
138 kV	New Cienega substation- Mountain View substation	TBD	TEP	CEC Not Yet Filed
138 kV	Gateway - Sonoita 138 kV transmission line	TBD	UNISOURCE	CEC Not Yet Filed
115 kV, 230 kV or 345 kV	RS26 - Fountain Hill substation	2014	SRP	CEC Not Yet Filed
115 kV, 138 kV	Nogales transmission line #2	TBD	UNISOURCE	CEC Approved - Case #111
115 kV	Apache/Hayden to San Manuel 115 kV line	2008	SWTC	CEC Not Yet Filed
115 kV	Western 115 kV line loop-in to Pantano	2009	SWTC	CEC Not Required
115 kV	Saguaro to Naviska 115 kV line	2009	SWTC	CEC Not Yet Filed
115 kV	Valencia to CAP Black Mountain 115 kV line	2009	SWTC	CEC Not Yet Filed
115 kV	CAP 115 kV line loop-in to SWTC Sandario	2009	SWTC	CEC Not Required
115 kV	Marana to Avra Valley 115 kV Line Upgrade	2010	SWTC	CEC Not Yet Filed
115 kV	Naviska to Thornydale 115 kV line	2010	SWTC	CEC Not Yet Filed

115 kV	Thornycroft to Rattlesnake 115 kV line	2010	SWTC	CEC Not Yet Filed
115 kV	Avra Valley to Sandario Tap 115 kV Line Upgrade	2011	SWTC	CEC Not Yet Filed
115 kV	Sandario Tap to Three Points 115 kV Line Upgrade	2011	SWTC	CEC Not Yet Filed
115 kV	Marana Tap to Marana 115 kV Line Upgrade	2012	SWTC	CEC Not Required
115 kV	CS1 to Three Points 115 kV line	2013	SWTC	CEC Not Yet Filed
115 kV	Point on the Kearny - Hayden 115 kV line to Future Hayden	TBD	SRP	CEC Not Yet Filed

Exhibit 22 – Arizona Public Service Project Summary

Voltage	Description	In-Service Date	Participants	Mileage	Permitting/Siting Status
500 kV	VW01 loop-in of Navajo-Westwing 500 kV line	2009	APS	0.95	Not Required
500 kV	Sugarloaf loop-in of Coronado-Cholla 500 kV line	2009	APS, SRP	0.95	Not Required
500 kV	TS9-Pinnacle Peak 500 kV line	2010	APS, SRP	26.00	CEC Approved – Decision #69343
500 kV	Palo Verde Hub-Sun Valley 500 kV line	2010	APS, SRP, CAWCD	45.00	CEC Approved – Decision #68063
500 kV	Sun Valley - TS9 500 kV line	2012	APS, SRP, CAWCD	TBD	CEC To be filed in 2008
500 kV	Palo Verde Hub - North Gila 500 kV #2 line	2012	APS, SRP, IID, WMIDD	110.00	CEC Approved – Decision #70127
500 kV	Series Capacitor Upgrade Project - Moenkopi-Eldorado 500 kV	2012	APS, SCE	0.00	CEC Not Required
500 kV	Palo Verde - Saguaro 500 kV line	TBD	CATS Sub-regional Planning Group	130.00	CEC Approved – Decision #46802
345 kV	345/69 kV Interconnection at Western's Flagstaff 345 kV bus	2010	APS	0.95	CEC Not Required
345 kV	Mazatzal loop-in of Cholla-Pinnacle Peak 345 kV line	2011	APS	0.95	CEC Not Required
230 kV	Milligan loop-in of Saguaro-Casa Grande 230 kV line	2009	APS	0.95	CEC Not Required
230 kV	Sun Valley -TS1 - 230 kV line	2010	APS	15.00	CEC Approved – Decision #67828
230 kV	Palm Valley - TS2 - TS1 - 230 kV line	2010	APS	12.00	CEC Approved - Decisions #66646 and #67828
230 kV	Sun Valley -TS1 - 230 kV line #2	TBD	APS	15.00	CEC Approved – Decision #67828
230 kV	Palm Valley - TS2 - TS1 - 230 kV line #2	TBD	APS	12.00	CEC Approved - Decisions #66646 and #67828
230 kV	TS9 - Raceway - Avery - TS6 - Pinnacle Peak 230 kV line	2010	APS	27.00	CEC Approved – Decision #69343
230 kV	SE10 loop-in of Saguaro-Casa Grande 230 kV line	2011	APS	0.95	CEC Not Required

230 kV	Sundance - Pinal South 230 kV line	2011	APS, ED2	6.00	CEC Filed – Case #136
230 kV	Desert Basin - Pinal South 230 kV	2011	APS, SRP	21.00	CEC Approved – Decisions #68093, #68291, #69183 and #69647
230 kV	North Gila - TS8 230 kV line	2012	APS	15.00	To be Filed in 2008
230 kV	TS9 - Raceway - Avery - TS6 - Pinnacle Peak 230 kV line Project – Avery Substation	2012	APS	0.00	CEC Approved – Decision #69343
230 kV	Jojoba loop-in of TS4-Panda 230 kV line	2013	APS	0.95	CEC Approved – Decision #62960
230 kV	TS9 - Raceway - Avery - TS6 - Pinnacle Peak 230 kV line Project – TS6 Substation	2013	APS	0.00	CEC Approved – Decision #69343
230 kV	Sun Valley - TS11 - Buckeye 230 kV line	TBD	APS	TBD	CEC Not Yet Filed
230 kV	Sun Valley - TS10 - TS11 230 kV line	TBD	APS	TBD	CEC Not Yet Filed
230 kV	Sun Valley - TS9 230 kV line	TBD	APS	TBD	CEC To be filed in 2008
230 kV	North Gila - Yucca 230 kV line	TBD	APS	TBD	CEC Not Yet Filed
230 kV	Yucca - TS8 230 kV line	TBD	APS	TBD	CEC Not Yet Filed
230 kV	Westwing -El Sol 230 kV line	TBD	APS	11.00	CEC Approved – Docket#U-1345
230 kV	Westwing - Raceway 230 kV line	TBD	APS	7.00	CEC Approved – Decision#64473
230 kV	Westwing -Pinnacle Peak	TBD	APS, SRP	22.00	CEC Approved – Decision #64473

Exhibit 23 – Dynegy Project Summary

Voltage	Description	In-Service Date	Participants	Mileage	Permitting/Siting Status
500 kV	Arlington Power Plant	TBD	Dynegy Arlington Valley	TBD	CEC Approved – Decision #64357

Exhibit 24 – El Paso Electric Project Summary

Voltage		Description	In-Service Date	Participants	Mileage	Permitting/Siting Status
345 kV		Greenlee switching station through Hidalgo to Luna		TBD	ELPE,PNM, TXNMP	28.00
CEC Approved – Case #21						

Exhibit 25 – Gila Bend Power Partners Project Summary

Voltage	Description	In-Service	Participants	Mileage	Permitting/Siting Status
500 kV	Hassayampa – Jojoba 500 kV line	TBD	GBPP	19.00	CEC Approved – Case#119 – Extension Request Pending
500 kV	Gila Bend Power Plant – Tap Gila River – Jojoba line	TBD	GBPP	6.00	CEC Approved – Case#109 – Extension Expires 4/2011

Exhibit 26 – Public Service Company of New Mexico Project Summary

Voltage	Description	In-Service Date	Participants	Mileage	Permitting/Siting Status
345 kV	Greenlee switching station through Hidalgo to Luna	TBD	ELPE,PNM, TXNMPC	28.00	CEC Approved – Case #21

Exhibit 27 – Salt River Project Summary

Voltage	Description	In-Service	Participants	Mileage	Permitting/Siting Status
500 kV	Sugarloaf loop-in of Coronado-Cholla 500 kV line	2009	APS, SRP	0.95	CEC Not Required
500 kV	TS9-Pinnacle Peak 500 KV line	2010	APS, SRP	26.00	CEC Approved – Decision #69343
230 kV	Desert Basin - Pinal South 230 kV	2011	APS, SRP	21.00	CEC Approved – Decisions #68093, #68291, #69183 and #69647
230 kV	Westwing - Pinnacle Peak	TBD	APS, SRP	22.00	CEC Approved – Decision #64473
500 kV	Palo Verde Hub-Sun Valley 500 kV line	2010	APS, SRP, CAWCD	45.00	CEC Approved – Decision #68063
500 kV	Sun Valley - TS9 500 kV line	2012	APS, SRP, CAWCD	TBD	CEC To be filed in 2008
500 kV	Palo Verde Hub - North Gila 500 kV #2 line	2012	APS, SRP, IID, WMIDD	110.00	CEC Approved – Decision #70127
500 kV	Palo Verde - Saguaro 500 kV line	TBD	CATS Sub-regional Planning Group	130.00	CEC Approved – Decision #46802
230 kV	RS17 - RS24	2012	SRP	TBD	CEC Not Yet Filed
230 kV	RS24 - RS22/SEV substations	2012	SRP	TBD	CEC Not Yet Filed
115 kV, 230 kV or 345 kV	RS26 - Fountain Hill substation	2014	SRP	TBD	CEC Not Yet Filed
230 kV	RS17 Loop-in	TBD	SRP	0.95	CEC Approved - Decisions #59791 and #60099
230 kV	Dinosaur - RS21	TBD	SRP	TBD	CEC Not Yet Filed
230 kV	Rogers - Browning	TBD	SRP	9.00	CEC Not Yet Filed
230 kV	Silver King - Browning	TBD	SRP	38.00	CEC Approved - Case #20
230 kV	Silver King - Browning 230 kV/Superior Tie	TBD	SRP	0.50	CEC Not Yet Filed
230 kV	Pinnacle Peak - Brandow	TBD	SRP	TBD	CEC Approved - Case #69
230 kV	Rogers - Corbell	TBD	SRP	12.00	CEC Not Required

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230 kV	Silver King - Knoll - Future Hayden	TBD	SRP	35.00	CEC Not Yet Filed
115 kV	Point on the Kearny - Hayden 115 kV line to Future Hayden	TBD	SRP	0.75	CEC Not Yet Filed
500 kV	Hassayampa - Pinal West #1	2008	SRP, TEP, SWTC, ED2, ED3, ED4	51.00	CEC Approved - Case #124
500 kV	Hassayampa - Pinal West #2	TBD	SRP, TEP, SWTC, ED2, ED3, ED4	51.00	CEC Approved - Case #124
500 kV	Pinal West-Southeast Valley/Browning	2011	SRP, TEP, SWTC, ED2, ED3, ED4	50.00	CEC Approved - Case #126
230 kV	Pinal South- Southeast Valley/RS22	2011	SRP, TEP, SWTC, ED2, ED3, ED4	30.00	CEC Approved - Decisions #68093 and #69291

Exhibit 28 – Santa Cruz Water and Power District Project Summary

Voltage	Description	In-Service Date	Participants	Mileage	Permitting/Siting Status
230 kV	Santa Rosa substation - ED5 substation	TBD	SCWPDA, SPPR	38.00	CEC Not Yet Filed
230 kV	ED5 - Pinal South (Pinal Central)	TBD	SCWPDA, SPPR	18.00	CEC Not Yet Filed
230 kV	ED5 - Marana	TBD	SCWPDA, SPPR	28.00	CEC Not Yet Filed
230 kV	Pinal Central (Pinal South) to a Future substation 6 miles northeast of Pinal Central #1	TBD	SCWPDA, SPPR	6.00	CEC Not Yet Filed
230 kV	Pinal Central (Pinal South) to a Future substation 6 miles northeast of Pinal Central #2	TBD	SCWPDA, SPPR	6.00	CEC Not Yet Filed

Exhibit 29 – Southern California Edison Project Summary

Voltage	Description	In-Service Date	Participants	Mileage	Permitting/Siting Status
500 kV	Devers - Palo Verde #2 Series Capacitor Upgrade Project - Moenkopi-Eldorado 500 kV	2011	SCE	230.00	CEC Denied - Case #130
500 kV		2012	SCE, APS	0.00	CEC Not Required

Exhibit 30 – Southwestern Power Group Project Summary

Voltage	Description	In-Service	Participants	Mileage	Permitting/Siting Status
500 kV	SunZia Project	2013	SWPG, SRP, TEP, ECP, Shell	500.00	CEC Not Yet Filed
345 kV	Bowie Power Project	2010	BOWIE	15.00	CEC Approved – Decision #64626

Exhibit 31 – Southwest Transmission Cooperative Project Summary

Voltage	Description	In-Service	Participants	Mileage	Permitting/Siting Status
500 kV	Hassayampa - Pinal West #1	2008	SRP, TEP, SWTC, ED2, ED3, ED4	51.00	CEC Approved – Case #124
500 kV	Hassayampa - Pinal West #2	TBD	SRP, TEP, SWTC, ED2, ED3, ED4	51.00	CEC Approved – Case #124
500 kV	Pinal West-Southeast Valley/Browning	2011	SRP, TEP, SWTC, ED2, ED3, ED4	50.00	CEC Approved – Case #126
500 kV	Pinal Central-Tortolita Substation	2011	SWTC, TEP	30.00	CEC Not Yet Filed
230 kV	Pinal South- Southeast Valley/RS22	2011	SRP, TEP, SWTC, ED2, ED3, ED4	30.00	CEC Approved - Decisions #68093 and #69291
115 kV	Apache/Hayden to San Manuel 115 kV line	2008	SWTC	4.50	CEC Not Yet Filed
115 kV	Western 115 kV line loop-in to Pantano	2009	SWTC	0.20	CEC Not Required
115 kV	Saguaro to Naviska 115 kV line	2009	SWTC	3.20	CEC Not Yet Filed
115 kV	Valencia to CAP Black Mountain 115 kV line	2009	SWTC	2.60	CEC Not Yet Filed
115 kV	CAP 115 kV line loop-in to SWTC Sandario	2009	SWTC	0.60	CEC Not Required
115 kV	Marana to Avra Valley 115 kV Line Upgrade	2010	SWTC	8.75	CEC Not Yet Filed
115 kV	Naviska to Thornydale 115 kV line	2010	SWTC	7.00	CEC Not Yet Filed
115 kV	Thornydale to Rattlesnake 115 kV line	2010	SWTC	19.00	CEC Not Yet Filed
115 kV	Avra Valley to Sandario Tap 115 kV Line Upgrade	2011	SWTC	2.80	CEC Not Yet Filed
115 kV	Sandario Tap to Three Points 115 kV Line Upgrade	2011	SWTC	13.71	CEC Not Yet Filed
115 kV	Marana Tap to Marana	2012	SWTC	0.20	CEC Not Required

	115 kV Line Upgrade				
115 kV	CS1 to Three Points 115 kV line	2013	SWTC	0.50	
230 kV	CS1 to Bicknell 230 kV line	2013	SWTC	21.00	CEC Not Yet Filed
230 kV	Upgrade of Apache to Butterfield 230 kV line	TBD	SWTC	16.00	CEC Not Yet Filed
230 kV	Future Sloan substation to Huachuca 230 kV line substation	TBD	SWTC	24.00	CEC Not Yet Filed

Exhibit 32 – Tucson Electric Power Project Summary

Voltage	Description	In-Service	Participants	Mileage	Permitting/Siting Status
500 kV	Palo Verde - Saguaro 500 kV line	TBD	CATS Sub-regional Planning Group	130.00	CEC Approved – Decision #46802
500 kV	Hassayampa - Pinal West #1	2008	SRP, TEP, SWTC, ED2, ED3, ED4	51.00	CEC Approved – Case #124
500 kV	Hassayampa - Pinal West #2	TBD	SRP, TEP, SWTC, ED2, ED3, ED4	51.00	CEC Approved – Case #124
500 kV	Pinal West-Southeast Valley/Browning	2011	SRP, TEP, SWTC, ED2, ED3, ED4	50.00	CEC Approved – Case #126
230 kV	Pinal South- Southeast Valley/RS22	2011	SRP, TEP, SWTC, ED2, ED3, ED4	30.00	CEC Approved - Decisions #68093 and #69291
500 kV	Pinal Central-Tortolita Substation	2011	TEP, SWTC	30.00	CEC Not Yet Filed
345 kV	Tortolita substation to Vail substation - Phase 1	2014	TEP	60.00	CEC Not Yet Filed
345 kV	Tortolita substation to Vail substation - Phase 2	TBD	TEP	0.00	CEC Not Yet Filed
345 kV	Tortolita substation to Vail substation - Phase 3	TBD	TEP	0.00	CEC Not Yet Filed
500 kV	Tortolita substation to Winchester substation	TBD	TEP	80.00	CEC Approved - Case #23
345 kV	Winchester substation to Vail substation - 2 nd Circuit	TBD	TEP	40.00	CEC Not Yet Filed
345 kV	Vail substation to South substation - 2 nd circuit	TBD	TEP	14.00	CEC Not Required
345 kV	Springerville substation to Greenlee substation - 2 nd circuit	TBD	TEP	110.00	CEC Not Yet Filed
345 kV	Tortolita substation to South substation	TBD	TEP	68.00	CEC Approved - Case #50
345 kV	Westwing substation to South substation - 2 nd circuit	TBD	TEP	178.00	CEC Approved - Case #15
345 kV	Future Gateway substation to Comision Federale de Electricidad	TBD	TEP	2.00	CEC Approved - Case #111
138 kV	Irvington substation to East Loop substation - Phase 3	TBD	TEP	9.00	CEC Approved - Case #66
138 kV	Vail - East Loop - Phase 3 - Third	TBD	TEP	22.00	CEC Approved - Case #8

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138 kV	138 kV line from Vail to East Loop					
138 kV	Vail - East Loop - Phase 4 - Harrison Tap of Roberts-East Loop Line	TBD	TEP	0.00	CEC Approved - Case #8	
138 kV	East Loop substation to Northeast substation	TBD	TEP	13.00	CEC Approved - Case #47	
138 kV	Loop existing West Ina substation to Tucson substation	2008	TEP	0.95	CEC Approved - Case #62	
138 kV	Extend 138 kV line from Midvale through future Spencer to future San Joaquin	2013	TEP	20.00	CEC Not Yet Filed	
138 kV	South to Duval CLEAR-Phase 2b - Extend 138 kV line from Canoa Ranch to future Duval	2013	TEP	24.00	CEC Approved - Case #84	
138 kV	Rancho Vistoso substation to future Catalina substation	2010	TEP	3.50	CEC Not Required	
138 kV	Loop existing Irvington station to Vail substation #2 line	2013	TEP	5.00	CEC Not Yet Filed	
138 kV	Tortolita substation -Rillito substation	TBD	TEP	24.50	CEC Not Yet Filed	
138 kV	Vail - SS NO27 - Cienega - SS No22- Spanish Trail Project - Phase 1 - Vail - Cienega line	2010	TEP	12.20	CEC Not Yet Filed	
138 kV	Vail - SS NO27 - Cienega - SS No22- Spanish Trail Project - Phase 2 - Vail - SSNO27 line	2020	TEP	5.30	CEC Not Yet Filed	
138 kV	Vail - SS NO27 - Cienega - SS No22- Spanish Trail Project - Phase 3 - Cienega - SSNO20 line	2023	TEP	14.00	CEC Not Yet Filed	
138 kV	New Cienega substation- Mountain View substation	TBD	TEP	4.70	CEC Not Yet Filed	
138 kV	Northeast - Snyder 138 kV - Tap for Craycroft-Barril substations	2011	TEP	8.00	CEC Not Required	
138 kV	Irvington substation - Tucson 138 kV - Tap for Kino substation	2012	TEP	10.90	CEC Not Yet Filed	
138 kV	Tortolita/Marana - North Loop Project -Phase 1 -Tortolita - Marana/Marana North Loop	2013	TEP	22.00	CEC Not Yet Filed	

138 kV	Tortolita/Marana - North Loop Project - Phase 2 - Marana - SSSN01/SSN01 - North Loop	2023	TEP	13.50	CEC Not Yet Filed
138 kV	North Loop substation - Rancho Vistoso substation 138 kV tap for new Naranja substation	2010	TEP	24.50	CEC Not Yet Filed
138 kV	DeMoss Petrie substation - Tucson substation 138 kV	2010	TEP	4.50	CEC Not Yet Filed
138 kV	Northeast 138 kV Static Var Compensator (SVC)	2008	TEP	0.00	CEC Not Required
138 kV	North Loop substation - SS N04 substation - DeMoss Petrie substation	2030	TEP	15.80	CEC Not Yet Filed
138 kV	Midvale substation - SS N022 substation - South substation 138 kV	2019	TEP	13.00	CEC Not Yet Filed
138 kV	Irvington - South Project - Phase 1 - Irvington - Corona - South line	2013	TEP	16.10	CEC Not Yet Filed
138 kV	Irvington - South Project - Phase 2 - Corona - SS N026 - South lines	2016	TEP	13.10	CEC Not Yet Filed
138 kV	Irvington - South Project - Phase 3 - Corona - Swan Southlands and Swan Southlands - SS NO 26 lines	2018	TEP	16.10	CEC Not Yet Filed
138 kV	La Canada - Orange Grove - Rillito substations 138 kV	2013	TEP	5.40	CEC Not Yet Filed
138 kV	Orange Grove substation - SS N06 substation	2017	TEP	3.60	CEC Not Yet Filed
138 kV	South substation - Hartt substation - Green valley substation 138 kV	2013	TEP	14.50	CEC Not Yet Filed
138 kV	Hartt substation - SS N029 substation 138 kV	2016	TEP	7.10	CEC Not Yet Filed
138 kV	Tucson substation - Downtown substation	2012	TEP	1.00	CEC Not Yet Filed
138 kV	DeMoss Petrie substation - SS N014 substation - Northeast substation 138 kV	2026	TEP	13.50	CEC Not Yet Filed
138 kV	Vail substation - SS N017 - Irvington substation 138 kV	2020	TEP	10.00	CEC Not Yet Filed

138 kV	Tortolita - North Loop - Rancho Vistoso Project - Tortolita to North Loop Phase 1	2008	TEP	14.30	CEC Not Yet Filed
138 kV	Tortolita - North Loop - Rancho Vistoso Project - Corridor Expansion Phase 3	2010	TEP	18.00	CEC Not Yet Filed
138 kV	Tortolita - North Loop - Rancho Vistoso Project - North Loop to Rancho Vistoso Phase 2	2009	TEP, SWTC	11.10	CEC Not Yet Filed
345 kV	Interconnection line-South substation to future Gateway sub	TBD	TEP, UNISOURCE	60.00	CEC Approved - Case #111

Exhibit 33 – UniSource Electric Project Summary

Voltage	Description	In-Service	Participants	Mileage	Permitting/Siting Status
345 kV	Interconnection line-South substation to future Gateway sub	TBD	TEP, UNISOURCE	60.00	CEC Approved - Case #111
230 kV	Griffith - North Havasu Transmission	2008	UNISOURCE	40.00	CEC Approved/Extended - Case #88
230 kV	Golden Valley 230 kV Project - McConico-Mercator Mill substations	2008	UNISOURCE	20.00	CEC Not Yet Filed
345 kV	White Hills substation	2010	UNISOURCE	0.00	CEC Not Required
115 kV, 138 kV	Nogales transmission line #2	TBD	UNISOURCE	3.00	CEC Approved - Case #111
138 kV	Upgrade existing 115 kV transmission line to Nogales	2013	UNISOURCE	60.00	CEC Not Yet Filed
138 kV, 115 kV	Valencia 115 kV substation expansion	TBD	UNISOURCE	0.00	CEC Approved - Case #111
345 kV, 138 kV, 115 kV	Gateway 345/115 kV or 345/138 kV substations	TBD	UNISOURCE	0.00	CEC Approved - Case #111
138 kV	Gateway - Sonoita 138 kV transmission line	TBD	UNISOURCE	10.00	CEC Not Yet Filed

Exhibit 34 – Wellton-Mohawk Irrigation and Drainage District Project Summary

Voltage	Description	In-Service Date	Participants	Mileage	Permitting/Siting Status
500 kV	Palo Verde Hub - North Gila 500 kV #2 line	2012	APS, SRP, IID, WMIDD	110.00	CEC Approved – Decision #70127

Figure 1: ATC for Arizona Paths in June 2007

Biennial Transmission Assessment for 2008-2017
Docket — E-00000D-07-0376

Exhibit 36 – Arizona Renewable Energy Task Force Map #2

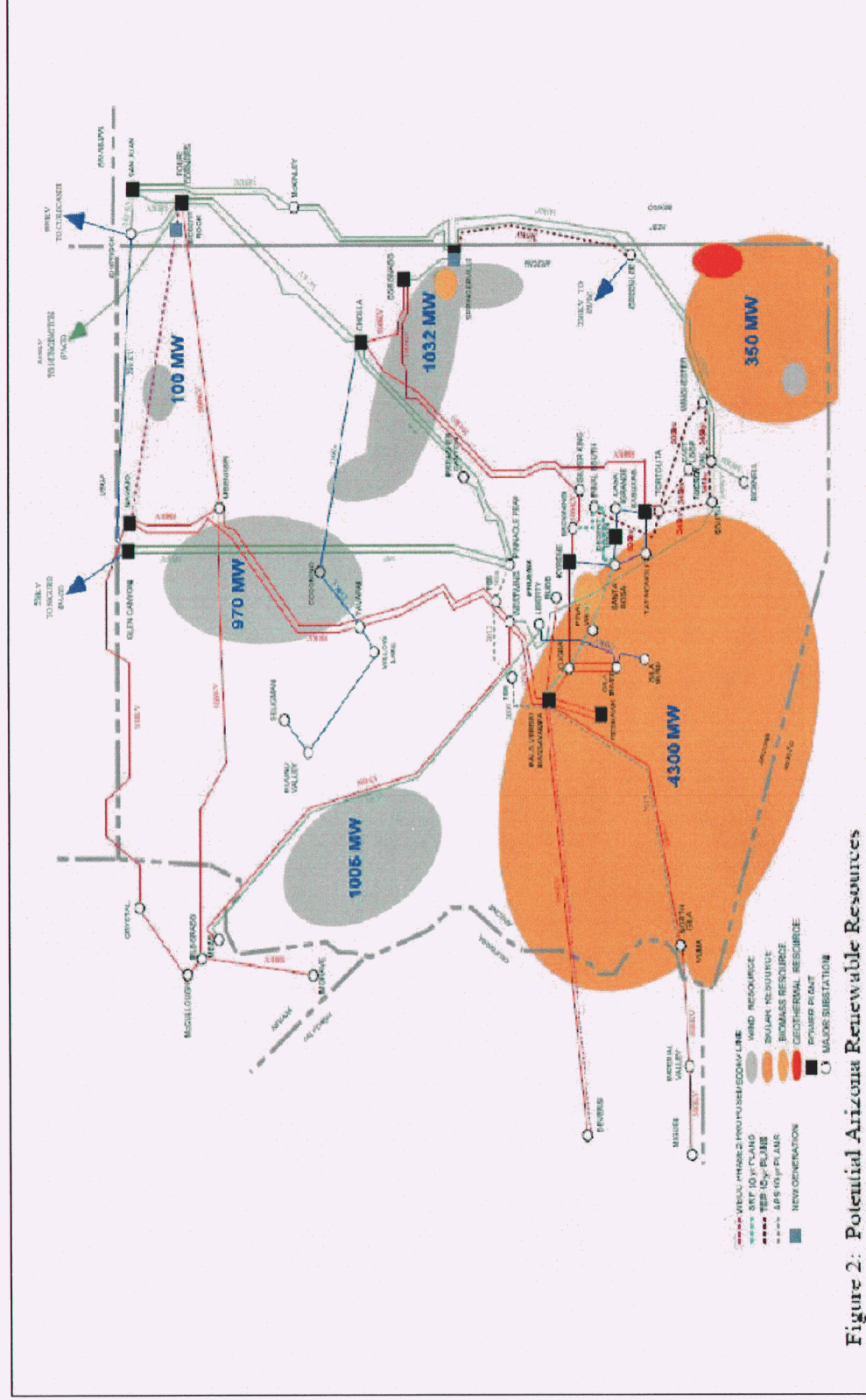


Figure 2: Potential Arizona Renewable Resources

Exhibit 37 – Arizona Renewable Energy Task Force Map #3

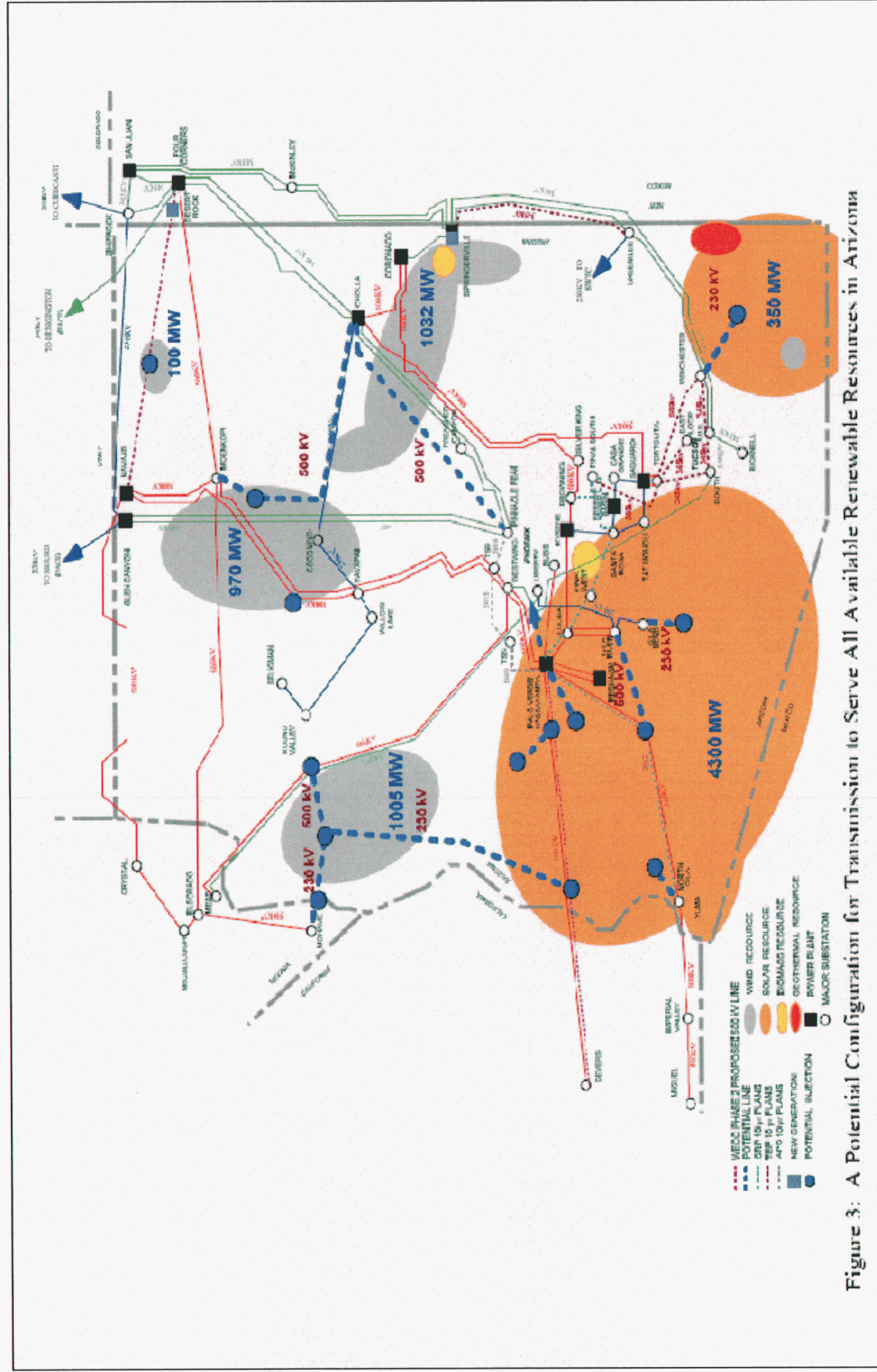
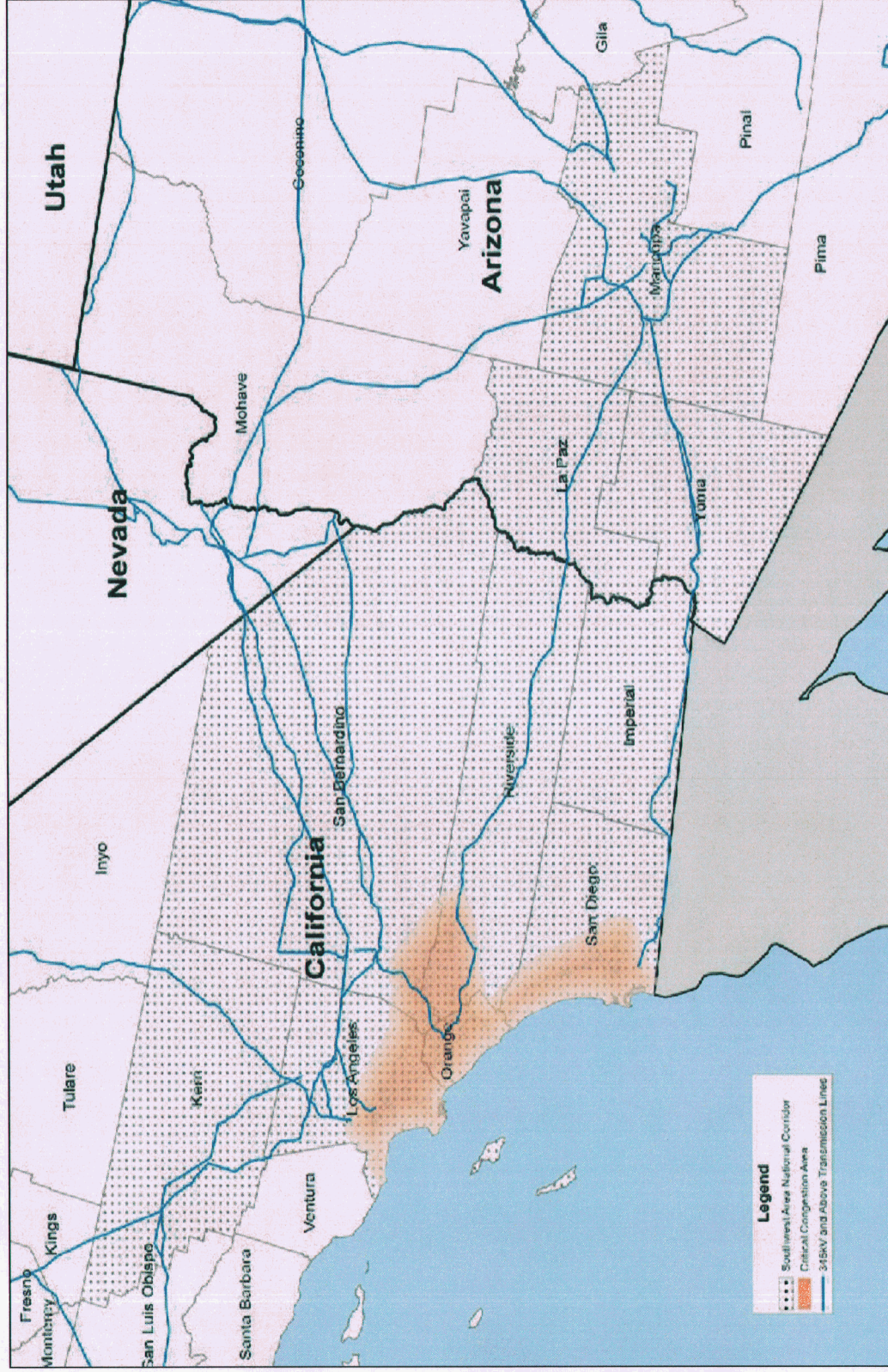


Exhibit 38 – NIETC Corridor Map²



² http://nietc.anl.gov/documents/docs/NIETC_Southwest_Area_Corridor_Map.pdf

Appendices

Fifth Biennial Transmission Assessment 2008-2017

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APPENDIX A - GUIDING PRINCIPLES FOR DETERMINATION OF SYSTEM ADEQUACY AND RELIABILITY¹

This document serves the dual purpose of providing the guiding principles for ACC Staff determination of electric system adequacy and reliability in the two areas of transmission and generation.

Transmission

A.R.S §40-360.02E obligates the Arizona Corporation Commission (ACC) to biennially make a determination of the adequacy and reliability of existing and planned transmission facilities in the state of Arizona. Current state statutes and ACC rules do not establish the basis upon which such a determination is to be made. Therefore, ACC Staff will use the following guiding principles to make the required adequacy and reliability determination until otherwise directed by state statutes or ACC rules.

1. Transmission facilities will be evaluated using Western Systems Coordinating Council (WECC), or its successor's, Reliability Criteria for System Planning and Minimum Operating Reliability Criteria.
2. Transmission planning and operating practices traditionally utilized by Arizona electric utilities will apply when more restrictive than WECC criteria.
3. Compliance with A.C.C. R14-2-1609.B² will be established by analysis of power flow and transient stability simulation of single contingency outages (n-1) of generating units, EHV and local transmission lines of greater than 100 kV nominal system voltage, and associated transformers. Relying on remedial actions such as generator unit tripping or load shedding for single contingency outages will not be considered an acceptable means of complying with this rule.

Generation

¹ Guiding Principles for ACC Staff Determination of Electric System Adequacy and Reliability: Arizona's Best Engineering Practices, Jerry D. Smith, ACC, pre-filed comments for the Gila Bend Power Plant Hearing, Docket No. E-00000V-00-0106, November 9, 2000

² R14-2-1609.B refers to the obligation of Utility Distribution Companies to assure that adequate transmission import capability and distribution system capacity are available to meet the load requirements of all distribution customers within their service area.

Pursuant to A.R.S. §40-360.07, the ACC must balance, in the broad public interest, the need for adequate, economical, and reliable supply of electric power with the desire to minimize the effect on the environment and ecology of the state when considering the siting of a power plant or transmission line. The laws of physics dictate that generation and transmission facilities are inextricably linked when considering the reliability of service to consumers. Therefore, it is appropriate that both components must be considered when siting a power plant. ACC Staff will use the following guiding principles to make the required adequacy and reliability determination for siting generation until otherwise directed by state statutes or ACC rules.

The best utility practices historically exhibited in the evolution of Arizona's generation and transmission facilities should be continued in order to promote development of a robust energy market. Non-discriminatory access to transmission and fair and equitable business practices must also be maintained and the service reliability to which the state is accustomed must not be compromised. Therefore, Staff support of power plant Certificate of Environmental Compatibility applications will be conditioned as set forth below.

ACC Staff support of power plant Certificate of Environmental Compatibility applications will be contingent upon the applicant providing, either in the application or at the hearing, evidence of items 1-3 below:

1. Two or more transmission lines must emanate from each power plant switchyard and interconnect with the existing transmission system. This plant interconnection must satisfy the single contingency outage criteria (n-1) without reliance on remedial action such as generator unit tripping or load shedding.
2. A power plant applicant must provide technical study evidence that sufficient transmission capacity exists to accommodate the plant and that it will not compromise the reliable operation of the interconnected transmission system.
3. All plants located inside a transmission import limited zone "must offer" all Electric Service Providers and Affected Utilities serving load in the constrained load zone, or their designated Scheduling Coordinators, sufficient energy to meet load requirements in excess of the transmission import limit.

ACC Staff support of power plant Certificate of Environmental Compatibility applications will further be contingent upon the Certificate of Environmental Compatibility being conditioned as provided in items 4-6 below:

4. The Certificate of Environmental Compatibility is conditioned upon the plant applicant submitting to the ACC an interconnection agreement with the transmission provider with whom they are interconnecting.
5. The Certificate of Environmental Compatibility is conditioned upon the plant applicant becoming a member of WECC, or its successor, and filing a copy of its WECC Reliability Criteria Agreement or Reliability Management System ("RMS") Generator Agreement with the ACC.
6. The Certificate of Environmental Compatibility is conditioned upon the plant applicant becoming a member of the Southwest Reserve Sharing Group, or its successor, thereby making its units available for reserve sharing purposes.

Approved by:

(Original Signed by Deborah R. Scott)

Deborah R. Scott

Director

Utilities Division

This date: (2/8/00)RS/jds:ESAR.doc

APPENDIX B – HISTORY OF COMMISSION ORDERED STUDIES

Local Area Transmission Import Study Requirements

In the First BTA, Staff identified five load pockets in Arizona that should be monitored for transmission import constraints: Phoenix, Tucson, Yuma, Mohave County and Santa Cruz County. The 2002 BTA added a sixth area located in Southeastern Arizona (Cochise County). The Cochise County area was added to the Commission's areas of concern due to a major blackout of the area in 2001. The 2004 BTA added Pinal County as a local area that needed to be monitored as well. Inclusion of Pinal County was prompted by the necessity of transmission providers to implement a remedial action scheme ("RAS") or special protection scheme ("SPS") for single contingencies with operation of the new Desert Basin and Sundance power plants and additional gas turbines at Saguaro Power Plant.

Cochise County and Santa Cruz County are served by radial transmission lines that result in interruption of service to significant numbers of customers for the outage of any one of the radial transmission lines serving these two counties. A study of the Cochise County Area was documented in the second BTA. At that time no Commission action was deemed necessary because local transmission switching capability was sufficient to minimize the outage time for customers. The Fourth BTA granted Southwest Transmission Cooperative ("SWTC") a time extension until January 2008 to resolve N-1 contingency violations for loss of the Apache to Butterfield or the Butterfield to San Rafael 230 kV line in its 2015 planning study and to file expansion plans to resolve those issues as part of its 2008-2017 ten year plan.

Santa Cruz County, on the other hand, is served by a single transmission line. The customer service and system impacts and risks associated with the loss of a single 115 kV line serving Santa Cruz County are well chronicled over prior BTA assessments and siting of the Gateway 345 kV transmission project.³ A NEPA environmental impact study has been concluded but federal records of decision and a Presidential Permit for the new 345 kV transmission line are still pending with federal agencies. Therefore UNSE installed a 20 MW generator in Nogales in 2004 and plan to upgrade the existing 115 kV line to 138 kV as interim solutions to ensure the ability to restore service.

TEP was required to file comments by June 30, 2007 to resolve concerns inside neighboring New Mexico and Western Area Power Administration ("WAPA") facilities identified in its preliminary study results for 2016.⁴ In addition, technical studies are to be performed and results filed with the

³ ACC Decision #64356

⁴ ACC Decision #69389, March 14, 2007, page 6, section 2.b.iii

Commission for the Cochise County Area to mitigate extended customer outages that resulted from an N-1-1 outage in 2007. A subcommittee of the Southern Arizona Transmission Study ("SATS") subregional planning group has undertaken this later task.

The simultaneous import limit ("SIL") and maximum load serving limits ("MSLC") of each of the Arizona load pockets is generally established in conjunction with RMR studies. The Commission approved SIL and MSLC definitions and methodology for performing RMR studies is documented in Appendix C. Arizona's subregional planning forums have also been performing a tenth year snapshot study of the state's transmission system. Those studies have traditionally considered N-0 and N-1 contingencies and provide additional information regarding the transmission capability of each local load pocket.

The Third BTA required that future studies also demonstrate compliance with the WECC and NERC single contingency criteria overlapped with the bulk power system facilities maintenance ("N-1-1") for the first year of the BTA analysis. Staff agreed with the subregional planning groups to limit the N-1-1 analysis to the tenth year for the 4th BTA. The tenth year N-1-1 assessment now only considers designated 230 kV and above planned projects as not in service and then N-1 contingencies are performed. This analysis is more strenuous than the NERC N-1-1 criteria. However, it does determine the possible system impact of a planned project either not getting built as planned or being delayed beyond the tenth year of the plan.

Reliability Must-Run Study Requirements

Previous BTAs also identified several of the local load pockets in Arizona where the load cannot be served using a normal economic merit order generation dispatch due to transmission limitations. During some portions of the year, generation units within the load pocket must be operated out of merit order to serve a portion of the local load. Such a resource requirement is often referred to as Reliability-Must-Run ("RMR") generation. The RMR power generated from local generation may be more expensive than the power from outside resources; and may be environmentally less desirable. During RMR conditions, transmission providers must dispatch RMR generation to relieve the congestion on transmission lines.

The Commission's generic electric restructuring docket established that existing Arizona transmission constraints would limit APS' and TEP's ability to deliver competitively procured power to less than the required 50% of Standard Offer Service's load.⁵ The Commission stayed this requirement in its Track B proceedings. However, each UDC is still obligated to assure that adequate transmission import capability is available to meet the load requirements of all distribution customers within its service area.⁶ Known

⁵ Direct Testimony of Jerry D. Smith and rebuttal testimony of Cary Deise, Docket No. E-00000A-02-0051

⁶ A.A.C. R14-2-1609.B

transmission constraints result in APS and TEP being dependent upon local RMR generation to serve their peak load during certain hours of the year.

In order to provide the Arizona load pockets access to potentially less costly power, the ACC Track A Decision No. 65154 ordered the Arizona utilities to work with Staff to develop a plan to resolve RMR concerns, and include the results of such a plan in the 2004 BTA. The same Decision ordered APS and TEP to file annual RMR study reports with the Commission in concert with their January 31 ten-year plan, for review prior to implementing any new RMR generation strategies, until the 2004 BTA is issued. The utilities readily responded and began providing RMR studies in 2003.

The Third BTA Decision No. 65476 approved a collaborative RMR study plan agreed to by all Arizona transmission providers.⁷ The 2003 RMR study forum included only the transmission providers. In contrast, since 2004 the RMR process has been open to all interested parties through Arizona's subregional study forums. The Fourth BTA required that "RMR studies continue to be performed and filed with ten year plans in even numbered years for inclusion in future BTA reports and that:

- Future RMR studies provide more transparent information on input data and economic dispatch assumptions, and
- Arizona utilities collaborate with the Staff to develop and effectively implement more stringent criteria as appropriate for RMR areas in the 2006 BTA."

Extreme Contingency Study Requirements

Staff's concerns regarding the adequacy and reliability of the Arizona electric system began in 2000 with the rapid development of new generation projects interconnecting with the Palo Verde Nuclear Generating Station. These projects all proposed to interconnect at the new Hassayampa 500 kV switchyard but were not increasing the capacity of the existing transmission lines already connected to the Palo Verde marketing hub. Large quantities of generation capacity and energy were at risk of being interrupted or curtailed for single contingency outages or credible outages of multiple lines. In addition the generation projects were being developed solely for merchant's commercial interest without obligations to assure existing generation reserves were sufficient to cover the outage risks the projects posed.

⁷ Appendix C

Therefore the Utilities Division of the Commission developed "Guiding Principles for Determination of System Adequacy and Reliability"⁸ for Staff's use in power plant and transmission line siting cases. The Commission endorsed this document via its Decision No. 65476 for the Second BTA. Then Condition No. 23 of the CEC was placed on APS and SRP in the Palo Verde to Rudd 500 kV siting case to formally require a study be performed to properly address the risks associated with interconnection developments at the Palo Verde Hub resulting in the 3rd BTA the adoption of the Palo Verde Hub interconnection criteria,

"Require all future interconnections proposed at the Palo Verde Hub, either new generation or new transmission lines, must perform a risk assessment of the Hub to ascertain to what degree the proposed project mitigates the pre-existing risks to extreme outage events. This assessment must precede a project's application for a CEC with the Commission. The recommendations of the Palo Verde Risk Assessment report should be followed if a proposed project would otherwise exacerbate the existing risk at the Hub."⁹

Since the initiation of the Commission's first BTA process Arizona has experienced several fire seasons with exposure to loss of multiple lines in a common corridor on forested lands. These events heightened the Commission's awareness of the state's vulnerability to loss of transmission lines in common corridors. These events were then upstaged by the major 500/230 kV transformer and 230/69 kV fires that occurred at Westwing and Deer Valley in 2004 and the Westwing 500/345 kV transformer fire in 2006. Therefore the third BTA required that the fourth BTA address and document extreme contingency outages studied for Arizona's major generation hubs and major transmission stations including identification of associated risks and consequences if mitigating infrastructure improvements were not planned. This extreme contingency study requirement was reinforced further when the Commission ordered the same requirement for the fifth BTA.

Renewable Energy Transmission Assessment Requirement

In the Fourth BTA, the Commission ordered a Renewable Energy Assessment stating specifically, "in the next BTA, Commission regulated electric utilities, in consultation with the stakeholders, should prepare an assessment of ATC for renewable energy and prepare a plan, including a description of the

⁸ Appendix A

⁹ ACC Decision No. 67457, December 14, 2004, page 4, section 7.e

location, amount and transmission needs of renewable resources in Arizona, to bring available renewable resources to load."¹⁰ This newest study requirement is focused on exploring transmission delivery obstacles for renewable resources that may choose to develop within the state. This study requirement is intended to assure that Arizona utilities can successfully comply with the renewable portfolio standards adopted by the Commission in 2006.

¹⁰ ACC Decision No. 69389, March 22, 2007, page 8

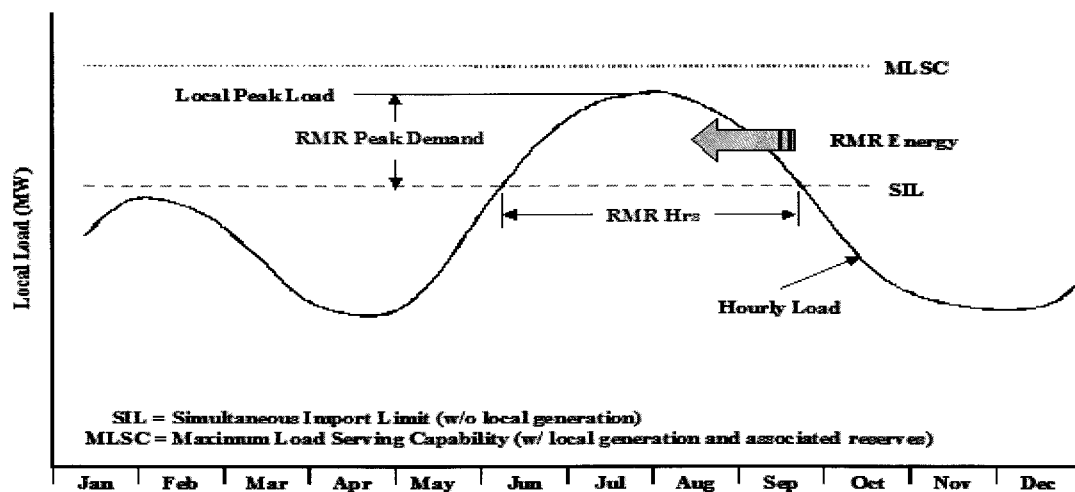
APPENDIX C - RMR CONDITIONS AND STUDY METHODOLOGY

In the 2002 BTA, Staff proposed that any UDC currently relying on local generation, or foreseeing a future time period when utilization of local generation may be required to assure reliable service for a local area, should perform and report the findings of an RMR study as a feature of their Ten-Year Plan filing with the Commission in January, 2003 and 2004. The 2002 BTA defined a Generic RMR Study Plan that required utilities to:

1. Define annual simultaneous import limits (SIL) for each transmission import limited area.
2. Provide a listing of all local generation and associated operational attributes.
3. Define RMR conditions for each year of the Ten-Year Plan.
4. Provide a local generation sensitivity analysis.
5. Identify and study alternative solutions.
6. Perform comparative analysis and present worth analysis of alternative solutions.

RMR conditions, required from RMR studies, are defined in the 2002 BTA and graphically presented in the following Figure 1.¹¹

Figure 1 – RMR Conditions



¹¹ 2002 BTA, Page 74-76

Essential RMR indicators that the Commission intends to receive from the RMR studies are:

- RMR hours - The number of hours during which the local load is above the SIL,
- RMR energy - The amount of energy served from RMR generation,
- RMR peak demand - The maximum RMR amount of capacity that the RMR generators would be required to produce,
- RMR costs - The costs of out-of-merit-order dispatch from RMR

The 2002 BTA established specific RMR procedures. The transmission system's simultaneous import limit (SIL) for each local constrained area is established for single contingencies (n-1) with no local generation in operation. An RMR condition exists during those times when the local load served by a UDC, or group of UDCs, exceeds that SIL. If no local generation exists for an RMR condition then the UDC(s) would have to utilize a load-shedding scheme for those contingencies that establish the SIL. This would imply a violation of WECC planning criteria since reliability practices are founded on the principle of continuity of service for single contingency outages.

When local generating units within the local load pocket are owned or under the operational control of the UDC(s), they are viewed as RMR units for the duration of the RMR condition. A local generating unit that is neither owned or under operational control of the UDC(s) may be considered a non-RMR unit. In some instances, a non-RMR unit may have a "must-offer" requirement to assure that system reliability is maintained. A local non-RMR unit that is operational during the hours an RMR condition exists will have the automatic effect of mitigating the constraint to the extent it serves local load or its capacity and energy is scheduled out of the local load pocket.

Local generation, irrespective of its composition of RMR and non-RMR units, may offer an acceptable planning solution to RMR conditions. The local RMR condition is essentially mitigated when local generation capacity and its associated voltage regulation ability is equal to or greater than that required to reliably serve the local RMR peak load. The question that needs to be answered is whether such dependence on local generation is prudent and in the consumers' best interest.

The maximum load serving capability (MLSC) of the local system is established by operating all local units at capacity, less local reserve requirements. The local MLSC equals to the SIL when there is no local generation. When local generation exists, the local MLSC is greater than the SIL but may fail to exceed the RMR peak load requirement. Such an RMR condition would require new transmission improvements or new local generation to assure reliable service to local consumers. When the MLSC is

greater than the local peak demand, then the RMR condition is mitigated and there is less risk that local load would be interrupted for local transmission or generation outages.

Utilization of reactive devices such as high voltage shunt capacitors, static or dynamic var compensators, or Flexible AC Transmission System (FACTS) control devices should be considered for voltage and var margin constrained SIL conditions. Similarly, maintaining a unity power factor at the sub-transmission bus of distribution substations and seasonal tap changes for transformers lacking automatic tap changer under load capability should be considered as a means of resolving voltage or var margin deficiencies. Advancing planned transmission lines or construction of previously unplanned lines should be among the alternatives studied for thermal and stability constrained SIL conditions.

A comparative analysis of all alternative solutions, including using local generation that mitigates the local RMR condition is to be documented. The following factors should be considered when documenting the merits of the various alternatives: impact on SIL, system reliability implications, system losses, operational flexibility, environmental effects, implementation requirements and lead-time, and opportunity for consumer benefits from competitive wholesale market. The following should also be identified in the comparative analysis of alternatives:

- The total expected cost, fixed and variable, for the local generation dispatch that results in the lowest local generation dispatch to mitigate annual RMR conditions.
- Total emission pollutants produced by the lowest local generation dispatch mitigating the annual RMR condition.

A present worth analysis of all alternative solutions is also to be performed. The cost analysis is to include an assessment of the total expected cost of operating local units versus remote units in combination with some transmission solution. Local and remote generation cost assumptions must be documented. The accuracy of RMR conditions depends upon technical studies, engineering assumptions and validity of data needed to determine:

1. Hourly load forecast for the future years.
2. SIL by ensuring that:
 - Aggregate local area load is the total substation load actually impacted by the transmission constraint;

- RMR generation within the local area is accurate; With RMR generation modeled out-of-service, the transmission system meets required normal (n-0) reliability criteria, showing no thermal and/or voltage limit violations;
 - With RMR generation modeled out-of-service, the transmission system meets required reliability criteria for all single contingency outages showing no thermal and/or voltage criteria violations; and
 - With RMR generation modeled out-of-service, the transmission system remains stable and shows no voltage instability.
3. RMR production costs by ensuring that:
- Analysis is done using industry recognized production-cost model.
 - Production-cost model database contains projected generation additions as accurate as possible, knowing in advance that future generation additions and unit commitments are dependent on many factors and are subject to change.
 - Hydro generation modeling reflects actual operating conditions as accurately as possible.
 - Thermal generation modeling reflects the current projection of variable operating and maintenance costs.
4. Comparison of the present worth of RMR production costs and present worth of transmission alternative costs.

APPENDIX D - QUESTIONS POSED TO INDUSTRY AND STAKEHOLDERS – WORKSHOP 1

To help facilitate Workshop discussion the following questions were posed to all prospective workshop attendees and participants:

1. What transmission related topics or policy issues do you desire to have added to the proposed agenda?
2. What specific FERC/NERC/WECC policy, standards or mandatory reliability requirements would you recommend that the Commission consider in its evaluation of Arizona's transmission adequacy assessment?

Questions posed specifically to all parties that filed ten year plans, for addressing during their Workshop presentations included:

3. Describe all technical studies that were performed in support of your filed transmission plan?
4. List all reports that exist for the studies identified in item 3 and identify which reports were not included in your ten year plan filing.
5. Identify all transmission projects in your transmission plan for which power flow and stability analyses have not been performed or for which reports have not been filed. Describe how and when do you intend to respond with the required studies and reports?
6. Describe any stakeholder input and review that occurred regarding your transmission plan.
7. Please identify the subregional transmission planning forum(s) in which your transmission plan was addressed. Were your project(s) or planned facilities studied in that forum? Did your project(s) or plan undergo a peer review in that subregional forum and were they incorporated in the subregional plan?
8. Identify all projects in your filed transmission plans that were not addressed in a subregional transmission planning forum as described in item 7.

APPENDIX E - 2008 BTA WORKSHOP I AND II LIST OF ATTENDEES¹²

BTA Workshops I & II Attendees

Last	First	Title	Representing	Phone	E-mail Address	Workshops Attended	
						Workshop 1	Workshop 2
Aguayo	Stacy	Reg. Relations Manager	APS	602-250-2681	stacy.aguayo@aps.com	X	
Aluther	Jeri	Attorney	Robert Lynch and Associates	602-254-5908	jeri@rslsynchaty.com	X	X
Amirali	Ali	V.P. Transmission & Market	LS Power Development LLC	408-204-7630	aamirali@lspower.com	X	
Anderson	Erinn		APS		Erinn.anderson@aps.com		X
Atkins	Steve		NAU	928-607-6635	steve.atkins@nau.edu		X
Bagley	Ken	Manager	Genesee Consulting	623-748-8989	kabagley@cox.net	P	X
Bahl	Prem	Staff	ACC	602-542-7269	pbahl@cc.state.az.us	X	P
Bailey	Cindy	Project Assistant	Southwestern Power Group	602-808-2004	cbailey@southwesternpower.com	X	
Bailey	Michael	Engineer	Dynegy	713-767-4524	michael.bailey@dynegy.com	X	
Barajas	David	Supt & Gen.	Imperial Irrigation District	760-982-3450	dbarajas@iid.com	X	

¹² BTA Workshop I was held on May 22-23, 2008 and BTA Workshop II was held on September 18, 2008 at the Arizona Industrial Commission Auditorium

Bates	Gary	Engineer	WAPA	602-605-2694	Bates@wapa.gov	X	
Beck	Ed	Superintendent Planning	TEP/UNSE	520-745-3276	ebeck@tep.com	P	
Belval	Ron	Planning Engineer	TEP	520-745-3420	rbelval@tep.com		X
Bloch	Steve		Bloch Communications	602-424-1730	steve@blochcommunications.com	X	
Brandt	Jana	Reg. Analyst	SRP	602-236-5028	ikbrandt@srpnet.com	X	X
Bryan	David	Engineer	SSVEC	520-720-6421	dbryan@ssvec.com	X	X
Bullock	Chris	Corp. Dev.	Atwell-Hicks	480-704-2644	-	X	
Byron	Don		Western	602-605-2685	Byron@wapa.gov	X	
Cabbell	Dana	Manager	SCE	626-302-0376	dana.cabbell@sce.com	P	X
Calkins	Ian	Public Affairs	Copperstate Consulting Group	602-229-1010	ian@copperstate.net	X	
Carr	Thomas A.		Sempra Energy	619-696-4246	tcarr@sempra.com	X	
Charters	Jim	Retired	N/A	623-572-7972	j_charters@msn.com	X	
Cobb	Steven		SRP			P	
Cole	Perry	Managing Director	Energy Capital	858-703-4445	pcole@ecpartners.com	X	
Cole	Brian	Manager Research Planning	APS	602-250-4332	brian.cole@aps.com	X	X
Couture	Dave	Director	TEP	520-884-3752	dcouture@tep.com		X
Deise	Cary		APS	602-250-1232	cary.dersi@aps.com	X	X
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Biennial Transmission Assessment for 2008-2017

Docket No. **E-000000D-07-0376**

List of 2008 Workshop Attendees
October 15, 2008

Appendix E-3

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Szot	Lisa		N.M. RETA	505-992-9627	-	X	
Theaker	Brian	Director Reg. Affairs	Dynegy	530-295-3305	brian.theaker@dynegy.com	X	X
Vaninetti	Jerry		High Plains Express			P	
Williamson	Ray	Engineer	ACC		-	X	X
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APPENDIX F – LISTING OF TERMINOLOGY¹³ AND ACRONYMS¹⁴

Terminology

Arizona Power Plant and Transmission Line Siting Committee: The committee that reviews proposals to construct power plants and transmission lines in Arizona. In 1971, the Arizona Legislature required that the Commission establish a power plant and line siting committee. The Committee provides a single, independent forum to evaluate applications to build power plants (of 100 megawatts or more) or transmission projects (of 115,000 volts or more) in the state. The Committee holds meetings and hearings that are open to the public. [Click here to learn more about the Siting Committee.](#)

Bundled service: Electric service provided as a package to the consumer including all generation, transmission, distribution, ancillary and other services necessary to deliver and measure useful electric energy and power to consumers.

Certificate of Convenience & Necessity (CC & N): A document granting operating authority to utilities.

Competitive services: All aspects of retail electric service except those services specifically defined as "Noncompetitive Services" pursuant to Corporation Commission Rules [R14-2-1601\(29\)](#) or noncompetitive services as defined by the Federal Energy Regulatory Commission.

Continuity of Service¹⁵: Each utility shall make reasonable efforts to supply a satisfactory and continuous level of service. With respect to the Fifth BTA, use of this term describes the desire for "continuity of service" following the loss of a transmission line.

Demand: The rate at which power is delivered during any specified period of time. Demand may be expressed in kilowatts, kilovolt-amperes or other suitable units.

Distribution lines: The utility lines operated at distribution voltage, which are constructed along public roadways or other bona fide rights-of-way, including easements on customer's property.

Distribution service: The delivery of electricity to a retail consumer through wires, transformers, and other devices that are not classified as transmission services subject to the jurisdiction of the Federal Energy Regulatory Commission. Distribution service excludes metering services, meter reading services and billing and collection services, as those terms are used herein.

Electric Service Provider (ESP): A company supplying, marketing or brokering at retail any competitive services pursuant to a Certificate of Convenience and Necessity approved by the Corporation Commission.

Environmental Portfolio Standard (EPS): A ruling by the Commission that requires any company serving electricity to an end-user to generate a portion of that electricity through renewable technologies such as wind, solar, biomass generators or landfill gas recovery.

Federal Energy Regulatory Commission (FERC): An independent regulatory agency within the US Department of Energy that, among other things, regulates interstate oil, natural gas and power transmission sales.

¹³ <http://www.cc.state.az.us/divisions/utilities/electric/terms.asp>

¹⁴ Listing of Acronyms obtained from Fourth Biennial Transmission Assessment, Page 1

¹⁵ Except from Arizona Administrative Code, R14-2-208(C)

http://www.azsos.gov/public_services/Title_14/14-02.pdf

Generation: The production of the actual megawatts of electricity or purchase of electricity through the wholesale market.

Green pricing: A program offered by an Electric Service Provider where customers elect to pay a rate premium for renewable generated electricity.

Pancaking: A term used to describe the layering of multiple tariff rates in point to point transactions.

PV Hub: Palo Verde power plant and switchyard, the Hassayampa switchyard, and the there 500 kV tie lines connecting the two switchyards.

Interruptible electric service: Electric service that is subject to interruption as specified in the utility's tariff.

Kilowatt (kW): A unit of power equal to 1,000 watts.

Kilowatt-hour (kWh): The electric energy equivalent to the amount of electric energy delivered in 1 hour when delivery is at a constant rate of 1 kilowatt.

Megawatt (MW): A unit of power equal to 1,000,000 watts.

Meter service: All functions related to measuring electricity consumption, including installation and repair of meters, but not including meter reading.

Point of Delivery: The point where facilities owned, leased or under license by a customer connects to the utility's facilities.

Power: The quantity of electricity being generated, transferred or used at any instant in time, usually expressed in kilowatts.

Service area: The territory in which the utility has been granted a Certificate of Convenience and Necessity and is authorized by the Commission to provide electric service.

Tariffs: The documents filed with the Corporation Commission which list the services and products offered by the utility and which set forth the terms and conditions and a schedule of the rates and charges for those services and products.

Transmission service: Refers to the transmission of electricity at high voltage to retail electric customers or to electric distribution facilities as defined by the Federal Energy Regulatory Commission (FERC) or Arizona Corporation Commission.

Utility: The public service corporation providing electric service to the public in compliance with state law, except in those instances set forth in Corporation Commission Rules, R14-2-1612 (A) and (B).

Utility Distribution Company (UDC): The electric utility entity regulated by the Commission that operates, constructs, and maintains the distribution system for the delivery of power to the end user point of delivery on the distribution system.

Acronyms

AC	Alternating Current	MORC	Minimum Operating Reliability Criteria
ACC	Arizona Corporation Commission	MOU	Memorandum of Understanding
ANPP	Arizona Nuclear Power Project	MVA	Megavolt-Ampere
APS	Arizona Public Service	MVAR	Megavolt-Ampere Reactive
ATC	Available Transfer Capability	MW	Megawatt
AZ	Arizona	n-0	No Contingency
AZNM	AZ-NM EHV Subcommittee	n-1	Single Contingency
BTA	Biennial Transmission Assessment	n-1-1	Overlapping Contingency
BTU	British Thermal Unit	n-2	Double Contingency
CA	California	NERC	North American Electric Reliability Corporation
CAO	Control Area Operator	NG	Natural Gas
CATS	Central Arizona Transmission System	NM	New Mexico
CAWCD	Central AZ Water Conservation District	NOI	Notice of Inquiry
CC	Combined Cycle	NOPR	Notice of Proposed Rulemaking
CDEAC	Clean and Diversified Energy Advisory Committee	NTP	Navajo Transmission Project
CEC	Certificate of Environmental Compatibility	OASIS	Open Access Same Time Information System
CRT	Colorado River Transmission Subcommittee	OATT	Open Access Transmission Tariff
DOE	Department of Energy	PJM	Pennsylvania-New Jersey-Maryland (ISO)
DPA	Dine Power Authority	PNM	Public Service of New Mexico
DSW	Desert Southwest Region	PURPA	Public Utilities Regulatory Policy Act
ED	Electric District	PV	Palo Verde
EFOR	Equivalent Forced Outage Rate	RMR	Reliability Must Run
EHV	Extra High Voltage	RMS	Reliability Management System
EOR	East of (Colorado) River	RTO	Regional Transmission Organization
EPACT	Energy Policy Act	SCE	Southern California Edison
EPS	Environmental Portfolio Standards	SCED	Security Constrained Economic Dispatch
ERO	Electric Reliability Organization	SDG&E	San Diego Gas and Electric
FACTS	Flexible AC Transmission System	SEV	South East Valley
FERC	Federal Energy Regulatory Commission	SIL	Simultaneous Import Limit
FOR	Forced outage rate	SRP	Salt River Project
FPA	Federal Power Act	SSG-WI	Seams Steering Group – Western Interconnection
GT	Gas Turbine	ST	Steam Turbine
HV	High Voltage	STEP	Southwest Transmission Expansion Planning Group
HVDC	High Voltage Direct Current	SWAT	Southwest Area Transmission Study Group
HY	Hydro	SWPG	Southwest Power Group
I/S	In-Service	SWTC	Southwest Transmission Cooperative
IID	Imperial Irrigation District	TEP	Tucson Electric Power
IPP	Independent Power Producer	TEPPC	Transmission Expansion Planning Policy Committee
ISO	Independent System Operator	TNMP	Texas-New Mexico Power Company
KRSA	K.R. Saline and Associates, PLC	TTC	Total Transfer Capability
kV	Kilovolt	UDC	Utility Distribution Company
kWh	Kilowatt-Hour	UNS	UniSource Energy Corp.
LSE	Load Serving Entity	WAPA	Western Area Power Administration ("Western")
MISO	Midwest Independent System Operator	WECC	Western Electricity Coordinating Council
MLSC	Maximum Load Serving Capability	WGA	Western Governors' Association

APPENDIX G – WESTCONNECT ANNUAL ADEQUACY STUDY

Purpose

This document describes a WestConnect subregional transmission study that will be performed annually for WestConnect by K.R. Saline and Associates, PLC (KRSA). The study results and associated report will be incorporated in the subsequent WestConnect Transmission Report.

Study Scope

WestConnect will annually perform a study to test the adequacy of its most recently published WestConnect Transmission Plan ("Plan") excluding conceptual projects. The adequacy of the Plan will be determined by documenting system performance relative to WECC / NERC planning requirements. Traditional N-0, N-1 and N-2 contingency outages will be performed for the 5th and 10th year of the current planning period. Any deficiencies in the Plan will be noted with sufficient lead time for WestConnect subregional transmission planning participants to investigate solutions for incorporation into the subsequent WestConnect Transmission Plan.

In addition, potential corridor outages involving planned facilities will be modeled and the resulting system performance documented. These corridor outages will only be performed in the 10th year of the current planning period. The purpose is to ascertain what degree of system reliability risk is associated with placing proposed projects in common corridors with other facilities. Identification of such risks in advance of siting of new facilities is needed with sufficient lead time to explore alternative routes. It is not believed that studying such corridor outages in the 5th year of the study period would offer sufficient lead time to pursue alternate routes.

Required Base Cases

This study will utilize a 5th and 10th year base case developed and coordinated for use in WestConnect's current subregional transmission planning cycle. The base case will incorporate the "sponsored and committed" transmission projects contained in the previously published WestConnect Transmission Plan. The base cases will not include the "conceptual" transmission projects contained in the WestConnect Transmission Plan because they either have no sponsorship or there is no firm commitment to build the projects by a specific date.

APPENDIX H – WESTCONNECT BIENNIAL LONG RANGE STUDY

Purpose

This document describes a long range subregional transmission study that will be performed biennially for WestConnect. The study results and associated report will be summarized in even numbered year WestConnect Transmission Reports.

Study Scope

WestConnect will biennially perform a technical study to explore conceptual long range transmission needs within the WestConnect planning area. The goal of the study is to develop and refine conceptual long range transmission options within the WestConnect planning area for the 10th year study time period and beyond. This study will focus solely on the WestConnect planning area's system performance for load forecasts and generation scenarios representative of this study period. Therefore, the study will be limited to power flow studies that investigate the system's performance for single contingency outages (N-1).

The scope of the WestConnect long range study will vary over time in order to address contemporary issues facing the industry. The conceptual projects studied in response to those contemporary issues will serve as an incubator for alternative transmission projects that may eventually become sponsored and added to a future WestConnect Transmission Plan. More importantly, the long range study process will broaden and extend the vision of future transmission line corridor needs in the WestConnect planning area.

The initial WestConnect long range study will serve a two fold purpose. The first relates to the transmission planning interface between the Transmission Expansion Planning Policy Committee's (TEPPC) economic studies of the Western Interconnection and subregional transmission planning groups. This functional study requirement will be a routine feature of the WestConnect long range study scope. The second initial long range study effort is exemplary of a contemporary industry issue: system wide integration of renewable energy projects.

1. The WestConnect long range study will provide traditional reliability oriented studies that investigate transmission solutions to long range congestion concerns raised by the annual TEPPC economic transmission expansion study report. This reliability based study effort will essentially complement and supplement the TEPPC transmission congestion study effort. As a result the study will need to explore a variety of generation expansion scenarios consistent with the prior TEPPC study. Results of this reliability based long range study will enable WestConnect to offer definitive conceptual transmission solution proposals for the subsequent TEPPC study cycle.
2. The initial long range study will explore conceptual transmission improvements needed to accommodate fully developed renewable resources located within the WestConnect planning area. This study effort will incorporate the findings of the NREL wind and solar integration study, the Colorado Energy Zones study, the New Mexico renewable energy collector study and the new SWAT AZ/NM renewable energy task force study effort.

Required Base Cases

This study will utilize a 10th year base case developed and coordinated for use in WestConnect's current subregional transmission planning cycle. The base case will incorporate the "sponsored and committed" transmission projects contained in the previously published WestConnect Transmission Plan. Additional base cases will be developed from the 10th year base case to model alternative renewable energy development scenarios and load forecast within the WestConnect planning area beyond the 10th year. These additional base cases will also model the "conceptual" transmission projects contained in the WestConnect Transmission Plan in a status "off" mode. The "conceptual" transmission projects will serve as a starter pool of potential transmission projects that could be called upon to ensure reliable service at higher load levels. Other conceptual transmission projects may be added to the pool of candidate projects as dictated by load and resource placement within the WestConnect study area.

APPENDIX I – REFERENCES OF INFORMATION

Transmission Planning Studies and related documents, used to develop this Fifth BTA report, were assembled from the following reports, presentations, and dockets:

Utilities' 2008 Ten-Year Transmission Plans

Arizona Public Service Company (APS)
Salt River Project (SRP)
Southwest Transmission Cooperative (SWTC)
Southwestern Power Group II (SWPG)
SunZia
Bowie
Southern California Edison (SCE)
Gila Bend Power Partners (GBPP)
Dynegy Arlington Valley, LLC
Wellton-Mohawk Irrigation and Drainage District (WMIDD)
Public Service Company of New Mexico (PNM)
Santa Cruz Water and Power District Association (SCWPD)
Tucson Electric Power Company (TEP)
El Paso Electric Company (EPE)
UniSource Electric (UNSE)
Western Area Power Administration (WAPA) - Unfiled

First Draft Comments and Workshop II Comment Summary Presentation

All comment in their entirety or the summary presentation can be found on ACC Commission Docket (<http://edocket.azcc.gov/>)

First, Second, Third and Fourth BTA Reports and 2008 Summer Preparedness Presentations

These reports and presentations can be found on the Arizona Corporation Commission website (www.cc.state.az.us/utility/electric/index.htm)

Arizona Corporation Commission's Docket Control

Items related to previous and present filings (<http://edocket.azcc.gov/>)

Reliability Must-Run Documents

ACC 2008 BTA Workshop I RMR Presentations and Reports

N-1-1 and Extreme Contingency Study Documents

ACC 2008 BTA Workshop I N-1-1 and Extreme Contingency Presentations

Transmission Projects Reports

Navajo Transmission Project (NTP)
Palo Verde-Devers 2 (PVD-2) – Southern California Edison
Harcuvar Project
Wellton-Mohawk Project
Three Terminal Plan (TTP) – Santa Cruz Water and Power District
Bowie Power Station
SunZia Southwest Transmission Project – Southwestern Power Group
High Plains Express Initiative
TransWest Express Initiative

Regional Committees and Working Groups Materials

Biennial Transmission Assessment for 2008-2017
Docket — **E-00000D-07-0376**

References
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WestConnect Documents (www.westconnect.com)

Southwest Area Transmission (SWAT)

Arizona Renewable Task Force

Central Arizona Transmission Study - High Voltage (CATS-HV)

Central Arizona Transmission Study - Extra High Voltage (CATS-EHV)

Colorado River Transmission (CRT)

Southeastern Arizona Transmission Study (SATS)

Short Circuit Working Group (SCWG)

Federal Energy Regulatory Commission (FERC)

FERC Reliability Standards (www.ferc.gov)

North America Electric Reliability Council (NERC)

NERC Reliability Standards (www.nerc.com)

Western Electricity Coordinating Council (WECC) Standards and studies

The standards can be found on the WECC website (www.wecc.biz) under "Click here for library".

National Renewable Energy Laboratory

Support documents and reports (www.nrel.gov)

Western Governors Association (WGA)

Support documents and Report documents (www.westgov.org)

California Energy Commission Website

Information relating to RETI and California renewable activities (www.energy.ca.gov)

Nevada Renewable Energy Transmission Access Advisory Committee Website

Information relating to RETAAC and Nevada renewable activities (<http://gov.state.nv.us/Energy/>)

Colorado Clean Energy Development Authority Website

Information relating to CEDA and Colorado renewable activities

(<http://www.colorado.gov/energy/utilities/clean-energy-development-authority.asp>)

Large Generator Interconnection Queues (http://www.oatiaoasis.com/cwo_default.htm)

Arizona Public Service Company (APS)

Salt River Project (SRP)

Tucson Electric Power (TEP)

Western Area Power Administration (WAPA)